ELECTRICAL REVIEW

25th DECEMBER, 1953

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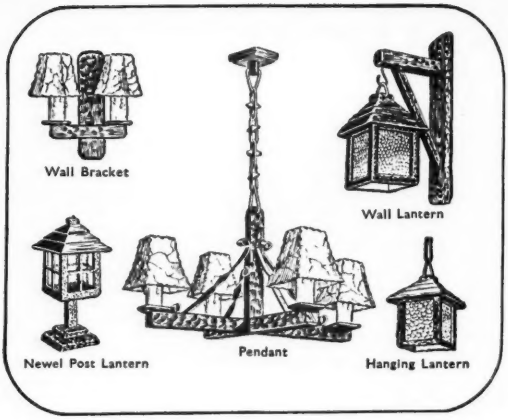

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ELECTRICAL REVIEW 25th DECEMBER, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. 153 • NO. 26

Atomic Energy Project

IN his criticism in the House of Lords of the White Paper relating to the organization proposed for developing nuclear fission for non-military purposes, Lord Falmouth performed a useful service in dispelling extravagant hopes that the process would result in lower prices of electricity in the early future. Looking further ahead, Lord Salisbury referred to atomic energy as the only means of coping with the rapid growth of world demand for electricity in face of lessening known power resources capable of economic exploitation. He too foresaw no sudden drop in the prices of electricity to consumers or the almost entire supersession of coal-fired power stations within the next fifty years or so, though he believed that eventually nuclear fuel might become cheaper than coal. Although thermal reactors, such as the experimental 45 MW unit at Calder Hall, seem likely within perhaps the next four years to supplement the output of normal power stations, they will at the same time eat into the by no means inexhaustible reserves of uranium and thorium and only put off the evil day of world power shortage. We doubt whether they will enable power station coal to be released for export, as Lord Salisbury hopes, partly because of its poor quality and partly because the growth of electrical load is likely to exceed the rate of construction of reactors. Since no way is known in which atomic energy can be directly applied to the production of power, any substantial aid from this source probably depends upon the commercial development of the "breeder" reactor, which will produce at least as much fissile material as it consumes.

In his presidential address to the Junior Institution of Engineers (reported by us last week), Sir John Hacking estimated that a significant contribution from atomic energy towards public electricity supply needs would become available in from fifteen to twenty years. This possibility indicates that the British Electricity Authority should become associated with the Atomic Energy

Corporation at an early stage of its work. A vast amount of exploration has still to be done by engineers and physicists, but, assuming the best brains to be attracted to the work, there can be little doubt that intensive research will produce more efficient and less expensive reactors. Thus, nuclear fission, the potentialities of which for ill have loomed so largely in men's minds, also promises to provide the means of arresting the decline of civilization as a result of a lack of harnessed natural power resources.

MILL ELECTRIFICATION

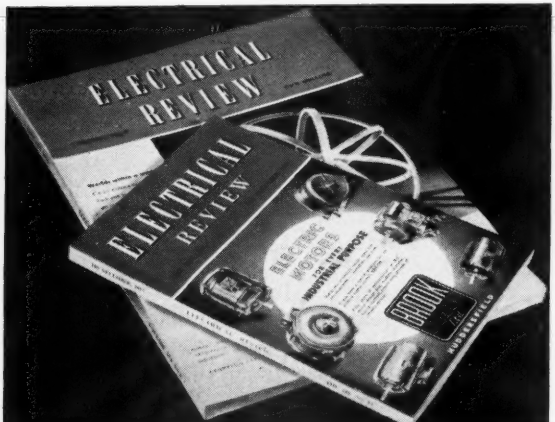
Many good examples have been reported in the *Electrical Review* of textile mills which have improved production by changing their out-of-date steam plant for modern electrical equipment. There still remains a great deal of scope in this industry, however. Recently Capt. W. Gregson, chairman of the Ministry of Fuel and Power's Fuel Efficiency Advisory Committee, said that the cotton industry was one of those in which traditional practice was tying the Committee's hands in the search for economy. He gave the thermal efficiency of the normal mill equipment as 10 or 11 per cent and contended that this could be almost doubled by the use of public electricity supply. This is a powerful argument for conversion, but not the only one.

LARGE DOLLAR CONTRACT

The announcement that the English Electric Co. has been successful in securing an important contract for generating plant for America comes as a fitting climax to the year's dollar export drive which, after some early frustration, has made steady progress. The present contract is for two water wheel generators, among the largest of their kind, for the McNary Dam on the Columbia River, and the English Electric's bid (the only British tender) was the lowest received, amounting to approximately £1·3 million.

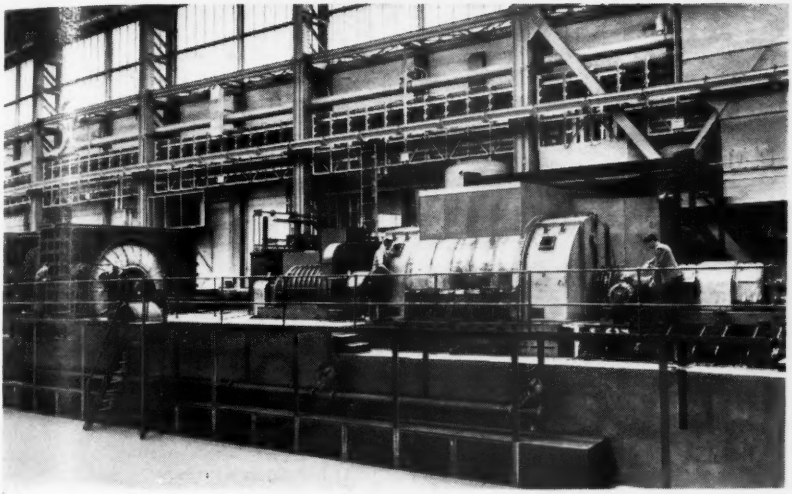
EXPANSION

Next week, after appearing for thirteen years in Lilliputian form, the *Electrical Review* reverts to its 1940 size, although it will contain many more pages than it did then. The expansion will not only enable us to include more matter (at the same price) but to greatly improve its presentation. It is intended to retain the customary features; the additional matter will be largely in the shape of signed articles from authoritative sources. Although some readers have preferred the convenience of the smaller journal we think that they will agree that the new one is a better job.



Season's Greetings

Once more it is our pleasant duty to thank all those firms who have sent us cards, calendars and diaries and to convey to them and all our readers the compliments of the season. We look forward with confidence to the industry's continued progress.



Large Alternator Testing

Test Bed Installation with Reactors for Artificial Loading

THE importance to the heavy electrical equipment manufacturer of having plant available at the works for testing prototype electrical equipment up to or in excess of its normal rated duty cannot be over-emphasized, particularly in its bearing upon the development of future designs. With the provision of facilities which permit extensive research under closely controlled and supervised conditions, essential data are quickly made available to the designer and can be used to the full in subsequent production without having to await the performance of the equipment in service.

Owing to the large outputs of generating plant for modern power stations, the only means of providing a full load test at the works is to resort to some form of artificial loading, and a satisfactory method of doing this is by the use of a reactor which will give simultaneously the rated current and voltage at zero power factor. Ideally the impedance of the reactor should be continuously variable over a wide range of load to cater for machines of different sizes and voltages, and to maintain the loading conditions constant throughout the test period. A test plant designed fully to comply with such requirements and for that reason believed to be probably the only one of this type yet to be put in service, has been installed at the Witton (Birmingham) Works of the General Electric Co., Ltd., and was demonstrated in performance in connection with the testing of a large hydrogen cooled alternator last week to a party of officials of the British Electricity Authority and electrical consulting engineers.

The new plant, which is intended to be used for development and research work, rather than for routine tests, is served by saturable reactors which provide a wattless

The combined raised test bed is so arranged that one machine can be erected or dismantled while a second is on test

load which can be controlled over an extremely wide range by varying the d.c. excitation of the reactor cores. Without d.c. excitation the reactors absorb only 500 kVA, while with d.c. excitation very smooth control is available from this low figure up to 100,000 kVA. By rearrangement of a system of external flexible links the reactors can provide maximum loads of 75,000 kVA at 11 kV and 22 kV, or 37,000 kVA at 6·6 kV.

The equipment comprises two reactors, each having a six-limbed core with tertiary windings so arranged that the current drawn from the alternator undergoing test is practically sinusoidal. Tests on the plant have established that the waveform has a maximum harmonic content of 1·5 per cent. The reactors are situated in the open adjacent to the test substation, and they are arranged for forced-oil cooling, the oil coolers, which are of the forced-draught type with integral fans, being mounted alongside.

D.c. excitation is provided by a twelve-phase grid-controlled rectifier of the pumpless steel tank type, the output voltage of which can be varied to meet the required conditions of excitation. This rectifier is housed inside the substation and is fed from the 11 kV works supply through an outdoor transformer.

A.c. from the alternator on test is taken to the reactors by tubular copper busbars, which have a normal capacity of 6,000 A and are insulated for 30 kV working. The alternator is solidly connected to the reactors, fault protection being arranged to trip the excitation both of the alternator and the reactors, thus making the a.c. circuit dead.

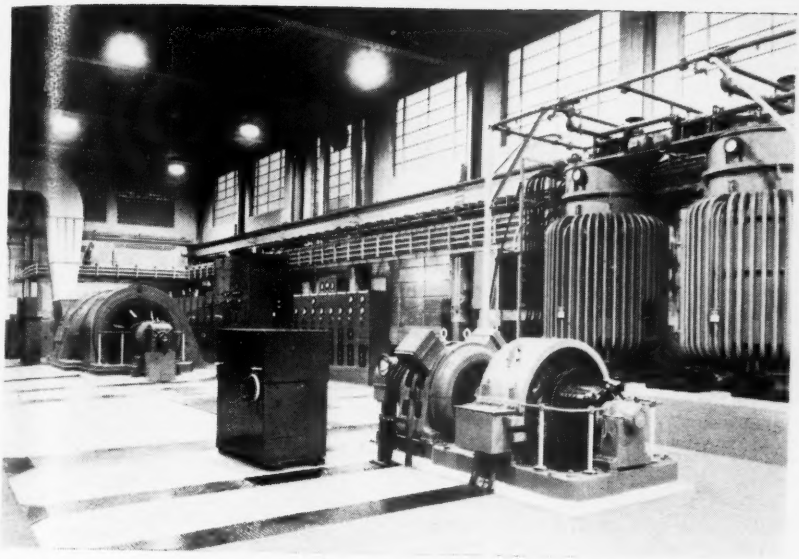
The combined raised test bed is so arranged that one machine can be erected or dismantled while a second is on test. The driving motor is mounted on a central platform and can be coupled up to machines erected on either side of this platform. Each bed is fully equipped with a closed circuit ventilation system for either air or hydrogen cooling and is arranged to support the stators and rotors of steam turbine-driven alternators ranging in output from 12,000 kW to 200,000 kW. As the alternator is erected on the test bed independently of its foundation plates foundation work on site can proceed simultaneously with the testing of the machine.

A 3,000 h.p. two-pole induction motor serves to drive the alternator and absorb all losses. It is supplied from the 11,000 V incoming service through a step-down transformer and two induction regulators and is controlled by a large remotely-operated liquid controller. With this equipment a 60,000 kW machine can be run up to speed in about five minutes and shut down in four minutes. For very large alternators additional power can be obtained by coupling a second motor in tandem.

Particular attention has been given to the lubrication system. Oil for the bearings and hydrogen seal is fed from a 2,500 gallon reservoir in which the oil is under an air pressure of 60 lb/sq in. This pressure and the flow of oil are maintained by screw type pumps which are independently driven by s.c. motors. In the event of a failure of the electricity supply the motors are automatically switched over to an entirely separate emergency supply, and should this emergency supply also fail, or should the pumps themselves break down, the capacity of the reservoir is adequate to permit an alternator of the largest size to be brought to rest in safety.

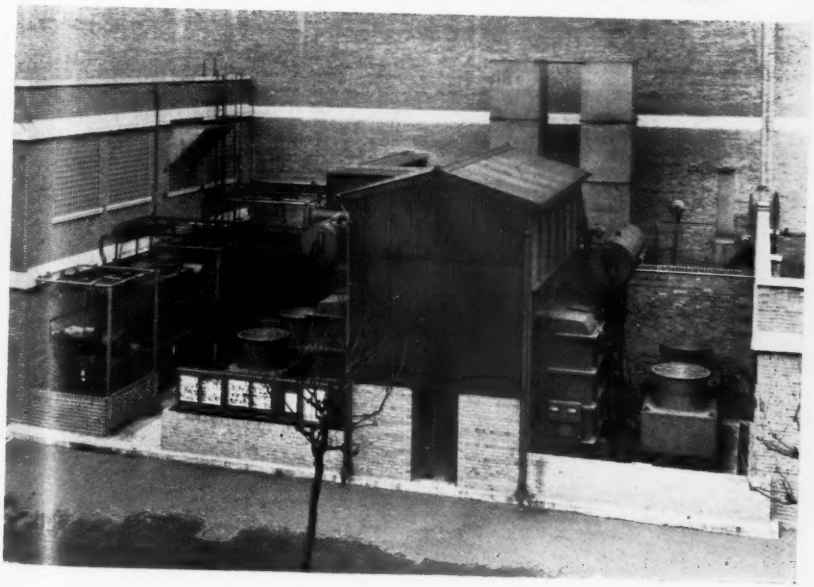
Heat generated in the alternator and in its bearings is dissipated in water coolers. As the volume of cooling water may approach 2,000 gallons per minute a closed water circuit is adopted, the water itself being cooled in forced draught spray coolers before being recirculated. In the case of hydrogen-cooled alternators the coolers are built into the machines, but for air-cooled alternators a separate test cooler is used. For test purposes the hydrogen control is entirely manual and is kept as simple as possible, the instruments comprising a purity meter, pressure gauge and an inclined oil gauge of the "U" tube type which indicates the fan pressure and also serves as a purity indicator.

The testing plant is supplied electrically from an adjacent substation which houses the power plant and 11,000 V and 440 V a.c. and 460 V d.c. switchgear. The power plant includes a motor generator set which comprises a 2,000 kW d.c. generator, a 4,000 kVA synchronous machine and a 750 h.p. synchronous induction motor. Also in the substation are a 400 kW exciter set; the two induction regulators which control the supply voltage to the driving motor of the alternator on test and the grid-controlled rectifier for the excitation



The substation houses, *inter alia*, a 2,000 kW d.c. generator, a 4,000 kVA synchronous machine and a 750 h.p. synchronous induction motor as one m.g. set

The reactors and the oil coolers are situated in the open adjacent to the test substation

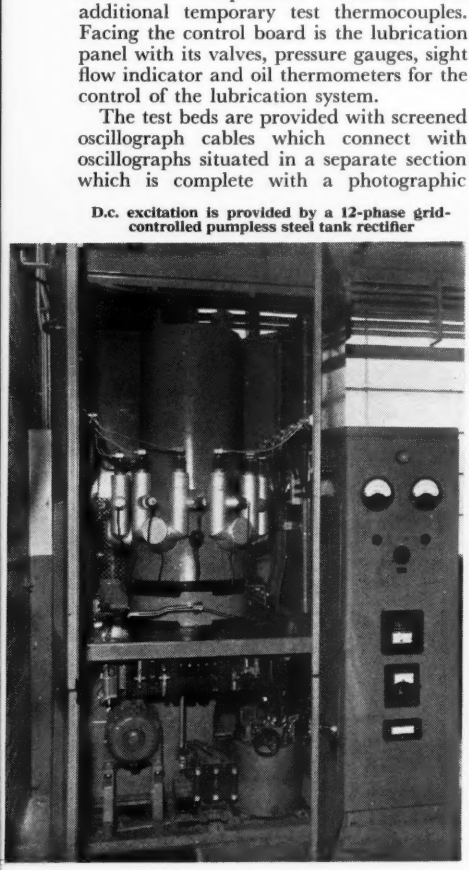


of the saturable reactors. An adjoining outdoor substation accommodates all the associated transformers, reactors and oil and water cooling apparatus.

All the test and auxiliary instruments are situated in a central control room in which the control board accommodates permanent metering for the driving motor circuit, and ammeters in the circuits of every essential auxiliary, together with the usual alarm warnings which indicate the failure of any essential circuit. The metering for the alternator under test is effected by portable substandard instruments, while 48-point and 12-point temperature indicators give readings from the normal embedded temperature detectors and additional temporary test thermocouples. Facing the control board is the lubrication panel with its valves, pressure gauges, sight flow indicator and oil thermometers for the control of the lubrication system.

The test beds are provided with screened oscillograph cables which connect with oscillographs situated in a separate section which is complete with a photographic dark room. Records are taken on a six-element electro-magnetic oscillograph using a film 120 mm wide by 320 m long. Alternative arrangements permit the use of a continuous film for measuring transients or where records over longer periods are required.

D.c. excitation is provided by a 12-phase grid-controlled pumpless steel tank rectifier



F.H.P. Motor Dimensions

FOR many years there has been a British Standard for the performance of fractional horse-power motors (B.S. 170), but there has been no dimensional standardization in the United Kingdom. This has now been rectified by the publication of B.S. 2048 : 1953, which establishes standard dimensions for two frame sizes of motors. These will normally cover the following horse-powers at 4-pole speeds, 50 c/s frequency, in drip-proof single-phase capacitor-type continuously rated motors:—Frame 56—$\frac{1}{6}$ to $\frac{1}{4}$ h.p. and Frame 66—$\frac{1}{2}$ to $\frac{3}{4}$ h.p.

The dimensions specified are those necessary to ensure that motors of different makes, and complying with the specification, will be mechanically interchangeable for all normal applications when mounted on the driven machines. With the exception of flange mounting motors, the dimensions specified are identical with those in the corresponding American N.E.M.A. standard for general-purpose motors, and so far as those dimensions are concerned, motors complying with B.S. 2048 will also be interchangeable with American motors built to the N.E.M.A. standard.

It is recognized that some time must elapse before all general-purpose motors can be supplied in complete compliance with this standard, and its application should therefore be subject to mutual agreement between contracting parties. The standard is applicable to d.c. motors and to single-phase and polyphase a.c. motors having enclosures of the protected, drip-proof and totally enclosed types. Motor manufacturers are not restricted as to their choice of frame sizes for a particular h.p./speed rating. Copies of the standard can be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 2s 6d.

Exports in a Buyer's Market

Under this title the Federation of British Industries, 21, Tothill Street, London, S.W.1, has published a report of the F.B.I. Sales Conference held at Buxton from 30th October to 1st November. It contains the introductory speeches by Sir Harry Pilkington and Sir William Rootes and five group discussions under the following headings:—Export opportunities; organizing for export; relations between exporter and importer (capital and consumer goods); the export sales force; and export promotion.

NEW BOOKS

Battery Chargers and Charging. By Robert A. Harvey, B.Sc. (Eng.), A.M.I.E.E. Pp. 400; figs. 284; index. Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 35s.

There has been steady progress in the design of storage batteries over the last twenty-five years, and there have been fundamental changes in the methods used for battery charging and control. This book describes all these new methods together with the older ones which are still in current use, showing how battery control problems have been solved in many industries.

The construction and chemistry of each type of storage battery are first explained, and there is a description of the fundamental principles of charging, together with much general information on charging technique. The book then describes how these principles are used in various special applications. These include electric vehicles and locomotives, emergency lighting and power systems, power stations, telephone exchanges, mines, ships, aircraft, railways, trolley-buses, cars and commercial vehicles, and generating plant for country houses and other isolated buildings. Home chargers for car and radio batteries, and charging arrangements for commercial garages and radio and electrical shops are dealt with in a separate chapter, while reference and design data are given in appendices.

The book will be of interest to all concerned with the installation, operation and maintenance of battery charging systems in any field, and particularly to engineers considering new or unfamiliar applications.

Colour and Light at Work. By R. F. Wilson. Pp. xii + 148; 6 figs. and 12 colour plates. Seven Oaks Press, 165, Victoria Street, London, S.W.1. Price 25s.

There can be no doubt that the use of colour in factories is being increasingly recognized as a valuable aid in producing more pleasant surroundings for the workers and so is not without its effect on production. The present book is written "for executives who should know the principles which vitally affect decisions in the installation of a lighting system and the appreciation of colour." In other words, its aim is to indicate the nature of the problem and to give some idea of the guiding rules for finding the best solution in any particular case.

As might be expected, the subject of colour is approached by way of the "colour circle" in which colours are arranged so that "the rate of change between adjacent colours is constant throughout" and the particular circle used is the Wilson chromatic circle of twelve hues. There is no attempt to treat the subject from the physical point of view on the basis of the C.I.E. trichromatic system.

The book is based mainly on Mr. Wilson's personal experience and observations and this accounts for the very frequent occurrence of sentences with the subject in the first person singular. His enthusiasm is obvious and he must be forgiven if it sometimes leads to the inclusion of a few pages of discussion only slightly relevant to the main subject and if the style often shows signs of haste and a need for more careful editing.—J.W.T.W.

The J. & P. Switchgear Book. By R. T. Lythall, M.I.E.E. Pp. 751; figs. and index. Johnson & Phillips, Ltd., Charlton, London, S.E.7. Price 35s.

The fifth edition of this work follows the general lines of its predecessor, published seven years ago, but has been revised, with the inclusion of many new illustrations, wherever necessary, to bring its contents up-to-date. An additional 100 pages is mainly allocated to two new chapters on automatic voltage regulators and surge protection and a new appendix dealing with voltage and current phenomena under conditions of short circuit.

Although the book has been produced under the auspices of a leading switchgear company, it also deals with designs and practices of numerous other manufacturers. It is clearly written with the declared object of presenting an outline of modern switchgear practice, especially designed for non-specialist users and the students for whom, as well as for others of more advanced knowledge in this field,

it is to be recommended. For the benefit of students special prices are available on application.—C.O.B.

The M.K.S. System of Units. By T. McGreevy, M.Sc.Tech., M.I.E.E. Pp. 283; figs. 65; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 21s.

Two separate approaches are given in this book for the two types of reader considered by the author. The first five chapters explain the m.k.s. system to the practising engineer who has to reconcile (and become reconciled to) formulæ expressed in either c.g.s. or m.k.s. units. The remainder of the book is addressed to teachers in technical colleges, who start with a clean slate and can introduce m.k.s. units as they develop their courses. There is no doubt that other readers also, for example, engineering students themselves and pure physicists, will find it a useful reference book; the appendices deal with every likely necessity for conversion from one system to another, and there are many carefully worked numerical examples in the text.

Teaching sequences for both full-time and part-time courses are outlined. The experimental starting-point in magnetism is the fluxmeter measurement of B; the concept H is introduced as "magneto-motive-force gradient," a procedure which seems both sound and far-sighted, though the name chosen is unfortunate since the one unvarying value in the magnetic circuit is the m.m.f.

In the later chapters the more important formulæ for instruments, machines and power calculations are derived from first principles. In electrical matters one feels that the less said about dimensions the better, and the chapter on dimensions might, in the reviewer's opinion, have been omitted. But it contains the shrewd and useful observation that units are often a valuable means of checking formulæ, much more satisfactory than dimensions, and gives an example of this procedure.

The book is called a guide, implying a more onerous mission than text-book or treatise. A reliable guide encourages people who would never have ventured unaided to undertake a new enterprise, and sees them safely through it. This volume should meet such requirements fully, and can be highly recommended.—G.R.N.

Books Received

Electricity and Magnetism for Degree Students. By S. G. Starling, B.Sc., A.R.C.Sc., F.Inst.P. Revised in collaboration with the author, by A. J. Woodall, B.Sc., Ph.D. Eighth edition. Pp. 650; figs. 452; index. Longmans, Green & Co., Ltd., 6 & 7, Clifford Street, London, W.1. Price 30s.

Television Receiver Design, Vol. 2. By P. A. Neetson. Pp. 155; figs. 118; index. Philips Technical Library. Cleaver-Hume Press, Ltd., 42a, South Audley Street, London, W.1. Price 21s.

Practical Metrology, Vol. 1. By K. J. Hume, B.Sc., M.I.Mech.E., M.I.Prod.E., and G. H. Sharp. Pp. 59; figs. 10. Macdonald & Co. (Publishers), Ltd., 16, Maddox Street, London, W.1. Price 6s.

Radio Engineering, Vol. 1. By E. K. Sandeman, Ph.D., A.C.G.I., M.I.E.E. Second edition. Pp. 779; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 60s.

Introduction to Power System Analysis. By F. S. Rothe. Pp. 187; figs. and index. Chapman & Hall, Ltd. Price 40s.

The Price of Fuel. By I. M. D. Little. Pp. 197; index. Oxford University Press, Amen House, Warwick Square, London, E.C.4. Price 12s 6d.

Manual of Mechanical Power Transmission. Third edition. Pp. 631; figs. and index. Trade and Technical Press, Ltd., 65–66, Chancery Lane, London, W.C.2. Price 51s.

Whitaker's Almanack

THE 1954 edition of Whitaker's Almanack includes many new features. To mark Coronation Year, for the first time in its history the Almanack contains a section of illustrations, consisting of sixteen pages of photographs of the Coronation and its attendant ceremonies, and other outstanding events and personalities of the year. The section dealing with public bodies has been extended to give full information about the newly-formed Press Council, the Council of Industrial Design and the Historic Churches Preservation Trust. In the statistical section, the article on British Railways has been recast, the effect of the Transport Act of 1953 explained, and many new facts and figures are given. The Almanack is the largest ever published (1,190 pages); there are the usual three editions, the complete edition (cloth boards, 15s), the shorter edition (paper bound, 7s 6d), and the library edition (bound in leather with coloured maps, 30s). It is obtainable from J. Whitaker & Sons, Ltd., 13, Bedford Square, London, W.C.1.

Engineering in Europe

Survey of Current Literature

IT is shown that with many modern instrument transformers with plastic insulation this type, beside other advantages, permits of the best use of space in any desired arrangement and grouping. The guiding principles are to design the transformers so as to adapt them to the general layout of lines and busbars without necessitating deflections from the general direction of the latter or to use the instrument transformers as, and instead of, spreader insulators of normal design or, in the well-known way, as bushings; where necessary, voltage and current transformers are combined and "concentrated" in the smallest space. Banks of these instrument transformers may be combined on "building-block" principles.

A very important condition which can always be satisfied is that the units may be mounted in any desired position; e.g., on floors, walls, ceilings, or brackets, vertically, horizontally or in an oblique position. The problem of combining several transformers, whether of the same or of different kinds, to form units or blocks no longer offers any difficulty, and æsthetically pleasing results are generally obtained.—"Instrument Transformers Considered from the Viewpoint of their Installation." A. Imhof, *A.S.E. Bull.*, Vol. 44, No. 14, pp. 612–616, 1953, in German.

Heavy-Current Circuit Breakers

The author discusses a.c. and d.c. heavy-duty circuit breaker designs for up to 550 V with the main stress laid on contact construction and materials, driving mechanisms and arc-quenching equipment. Brush or spring type contacts have long been replaced by solid copper or, preferably, silver contacts controlled by strong steel springs, which results in a great improvement in the heat transfer and contact pressure. A special feature of these high-duty circuit breakers is very robust mechanism using a patented anti-vibration and anti-bounce design, incorporating a "lazy-tongs" element, making for high shock-proofness and compactness of the mechanism. The contact fingers are under individually controllable spring pressure, the variations of which can easily be supervised on thermal indicators (since drop of the contact pressure causes undue temperature rises).

The remote-control drives are either electrical, hydraulic or pneumatic; as a rule the first variant is chosen and then operated by 110 or 220 V d.c. with robust plunger-type electromagnets, intermediary contactor and push-button control. The quenching chambers are of cellular or baffle-plate design, a type which does not break up the arc, but is designed to provide sufficient cooling to make arc extinction possible.

Very satisfactory test results with currents up to 50,000 A by breakers rated for 800 A are reported, and an actual service incident is mentioned in which a 12,500 A breaker interrupted 150,000 A.—"Low-Voltage Circuit Breakers for Very Heavy Currents." G. Douheret, *Bull. Sci. Ass. Ing. Elect. Montefiore*, No. 5, pp. 345–364, 1953, in French.

Stabilized Differential Protection

Stabilization of a differential protection means the de-sensitization of the differential relays for faults outside the protected zone. This is particularly important since, for example, short-circuits in a system supplied by a generator with differential protection produces undesirable difference currents in the differential relays owing to the unequal ratios of the current transformers supplying the relays. Early types of partly stabilized differential protections were the ratio-differential protection or Geise's blocking relay (the latter discriminating on the basis of current direction).

A new type of relay combines differential and blocking relay and thus permits of obtaining minimum tripping times and optimum selectivity. The principle used is that of a double-yoke electro-magnetic

relay with a tongue, one of the yokes being energized by the neutral-point-side current transformer; the tongue carries one winding energized by the busbar-side current transformer plus the differential winding carrying the sum of the two currents which under normal conditions is approximately zero.

The magnetizations produced by normal currents and by outside short-circuit currents are equi-directional and thus tripping is avoided. Internal short-circuits whether fed from the neutral-point side or from the busbar side, produce opposed currents and thus close the trip circuit. Applications of this relay in generator and transformer protection are described in great detail in "Novel Stabilized Differential Protections," L. Ferschl, *E.u.M.*, Vol. 70, No. 13, pp. 285–291, 1953, in German.

Transmission System Harmonics

Every element of an a.c. system producing a distortion of the voltage and/or current is a generator of harmonics, and it is convenient to distinguish between those producing predominantly harmonic voltages and those giving rise to harmonic currents. The first class comprises mainly transformers and synchronous and asynchronous machines and the second class includes rectifiers, arc-welding equipment and fluorescent lamps.

The harmonics are troublesome and may become dangerous in systems containing capacitor banks, which not only alter the distribution of the current and voltage harmonics, but may amplify their magnitudes considerably. Then the capacitors themselves become threatened by the amplified harmonics and special protection is required, unless the design of the capacitors is such as to exclude resonance phenomena. The latter is possible by a judicious selection of the powers of the banks and also by altering their situation in the system, if this alteration is otherwise permissible.

As the author shows, the analysis of the generators of harmonics as to order and magnitude of their harmonic output is a relatively simple problem, especially for transformers, and the theoretical determination is easily checked by c.r.o., nor is this determination more difficult for alternators and rectifiers. The propagation of harmonics in a system is best determined by quadripole theory. The measurement of the harmonic short-circuit impedance is conveniently based on Thévenin's theorem. Its use for the predetermination of harmonic currents which may be circulating in capacitor banks is stipulated by French regulations.—"Generation and Flow of Harmonics in Transmission Systems." H. Prigent, *Revue Gen. Elec.*, Vol. 62, No. 6, pp. 303–312, 1953, in French.

Uses of Electrolytic Tanks

The most frequently used method of measurement by electrolytic tank, when it is required to determine distributions of potential, field gradient and resistances between electrodes in steady fields, or voltage distributions in variable fields, is the method based on a simple a.c. bridge circuit (d.c. operation is excluded because of polarization phenomena). The method of the electrolytic tank has so far proved most successful in electron optics, and power engineers have not used this valuable aid to any considerable extent.

However, research institutes in most countries have for years now done a great amount of spade-work in this respect and obtained useful results in three different fields, viz., on field distribution around the poles and in the slots of electrical machines (obviously on models of the configuration placed in the tank); on potential distribution and field gradients of insulator and bushing shapes with a view to determining the dielectric strength characteristics of these insulators; and on earthing arrangements for power systems, for the purpose of determining propagation resistances and step voltages around and above these. In none of these cases can the results of the measurements which must be carried out under idealizing assumptions (since it is practically impossible to reproduce the actual conditions in every detail) represent more than a working approximation to the real conditions. Theoretical methods have been developed, however, for carrying these approximations one step further by appropriate corrections applied to the results of the measurements.—"Use of the Electrolytic Tank for the Solution of Problems in Power Engineering." H. Schmidl, *E.u.M.*, Vol. 70, pp. 309–316, 1953, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Electric Engraving Tool

A HAND-HELD electrically operated engraving tool has just been brought out by BURGESS PRODUCTS CO., LTD., Brookfield Road, Hinckley, Leics. It operates on the vibratory principle at the rate of 100 strokes per sec from 50 c/s mains and has been designed to withstand the heavy wear and tear of continuous industrial use. The moulded casing of this "Vibro-Tool" is of oil-impervious hard rubber and is supplied complete with 6ft of rubber sheathed cable and a three-pin 5 A moulded rubber plug top. The engraving point is normally tungsten-carbide tipped but diamond-tipped and other types of points are available to suit various requirements. The tool is available for operation on various 50 c/s mains voltages ranging from 24 V to 250 V.

Multi-Circuit Rotary Switch

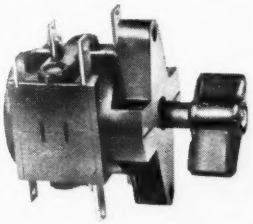
A 10 A multi-circuit rotary switch, known as the "Tenamp," has just been put on the market by AUSTINLITE, LTD., Lighthouse Works, Smethwick, Birmingham. In its standard form it will deal with many circuit applications; eighteen are illustrated in a leaflet accompanying the switch, ranging from single-phase on/off, to three-phase reversing. The mechanism is four-way double-pole slow make and break, a spring loaded roller ensuring that it locates positively in each position. The line contact principle is used and constant contact pressure is ensured by means of a separate compression spring which cannot get hot because it does not carry current.

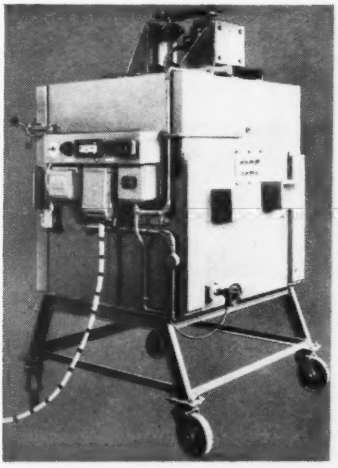
The ratings are 5 A 440 V and 10 A 250 V a.c. and 5 A 250 V d.c. for non-inductive loads. The handle is reversible, making the switch suitable for mounting on panels from $\frac{1}{8}$in to $\frac{1}{2}$in thick.

Laboratory Oven

A recent addition to the range of low temperature ovens made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is a portable unit intended for laboratory work. It incorporates all the features required to permit checking and controlling movement of components during tests involving long periods of heat treatment.

The oven has a standard double-case construction with ample heat insulation, and a full length door at the front. Forced air circulation is provided by a centrifugal fan in the roof operated by an induction motor. Sheathed wire elements are mounted on the

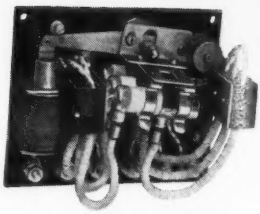




Above: **Austinlite multi-circuit rotary switch.** *Right:* **G.E.C. oven for laboratory work.** *Below:* **Burgess "Vibro-Tool" engraver**

side walls behind metal shields which protect the charge from direct radiation and at the same time form part of the air circulation system.

The oven has an internal capacity of 3 cu ft and is rated at 9 kW. Its temperature is controlled by an expansion thermostat and the oven is provided with temperature indicating and recording instruments, door switch and pilot lamps. Maximum operating temperature is 350 deg C. Through connections are provided at the rear of the oven for external and internal connections to thermocouples for checking charge temperatures.



Electro-Magnetic switch relay

Mercury Switch Relay

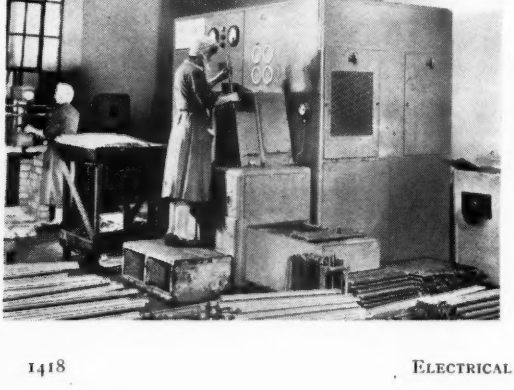
The general purpose mercury switch relay made by the ELECTRO-MAGNETIC CONTROL CO., 17, Leigh Road, Leyton, London, E.10, incorporates a solenoid movement with adjustable gravity zero return action which makes possible the maximum performance from a limited control source. It can be fitted with one, two or three mercury tubes and can be arranged to make or break a circuit upon the energizing of the operating coil with a maximum of 30 A loading on voltages up to 500 V a.c. With a 200–220 V operating coil the current consumption is 18 mA and with a 230–250 V coil it is 17 mA. However, the operating coil can be wound for any voltage between 0·5 V and 500 V. The switch is mounted on a panel 6in by 5in with fixing centres 5½in by 4¼in and the overall depth is 4in.

PIN HARDENING INSTALLATION

A HIGH frequency induction bar hardening heater produced by the General Electric Co., Ltd., has been installed at the Cardiff Works of Curran Steels, Ltd., for the surface hardening of tank track pins. The pins are of carbon steel and are of diameters ranging from 0·5 to 1in. It is necessary to harden them to depths ranging from 0·025 to 0·050in with a minimum hardness of 54 Rockwell C and within close limits of eccentricity. Before the introduction of h.f. heating it was found difficult, and in the case of one pin size impossible, to restrict the hardened surface to within acceptable tolerances; thus all the bars had to be straightened.

In the new equipment the pins are placed on the upper V block of the handling machine and are then automatically fed by rollers at a controlled rate through the heating inductor and quenching device. They are finally ejected into a collecting box from which they are removed in baskets. To accommodate the range of pins to be hardened, easily interchangeable heating inductors and feed rollers are provided, the speed of the rollers being variable to give the required depth of hardening on pins of different diameters.

The quenching medium is cooled by an air blast heat exchanger and is recirculated, and full protection against possible misuse of the equipment is incorporated. Once set up the machine can be tended by unskilled labour. The complete equipment comprises a 25 kW h.f. generator, bar handling gear, heat exchanger, and voltage stabilizer, and it occupies a total floor space of 60 sq ft. It is operated from a standard three-phase supply.



25 kW h.f. induction heater dealing with Centurion tank track pins

VIEWS on the NEWS

By REFLECTOR

WHEN my house was built I insisted that I should have a diagram showing the position of the wiring to avoid possible trouble if and when alterations or extensions became necessary. I am reminded of this by a letter in *John Bull* in which the writer complains of the amount of damage done to floorboards when an electrician was endeavouring to trace a fault. He says: "The law should insist that a blue print should be drawn up when a house is built and later additions or alterations noted on it." I do not think legislation should be necessary to secure this service to the consumer but the idea is one which electrical contractors might consider.

* * *

Mr. F. de la C. Chard, Lecturer in Electrical Engineering at Bristol University, started a hare when he insisted at a recent Bristol Electric Club dinner that "electric" was the genuine adjective. He deprecated the use of "electrical," saying that the extra syllable had no force at all: "it makes a staccato word into a sloppy word." I suppose it is difficult to justify the employment of both adjectives, save by usage or euphony—and I am not too sure of the latter. Nevertheless, the exclusive adoption of "electric" would cause a bit of bother. Think of all the organizations which would have to change their names! The I.E.E., the B.E.A.M.A., E.D.A., E.P.E.A., A.S.E.E. E.T.U.—practically all electrical (or electric) associations, not to mention the electrical Press.

* * *

Editors of Electricity Board magazines should keep a careful watch on their contributors, remembering that their publications go outside the industry. I will not specify which, but one of these magazines includes in its Christmas number a humorous drawing showing a plague of graphs in an electricity supply office. That is bad enough, but when it is seen that there are steep upward movements in graphs relating to "Red tape consumed," "Man-hours wasted" and "Consumers' complaints," while the "Units consumed" curve is falling the magazine is laying the service open to adverse comment from perverse people.

* * *

During a "peep behind the scenes of Grantham's electricity supply" a representative of the *Grantham Journal* seems to have been let into a closely-guarded secret:—

> "I was informed that Grantham draws its power from the modern Staythorpe station, reputed to have a wing which could be switched to the production of household atomic power."

As the next sentence begins "Futuristic prospects apart . . .", I am forced to abandon the thought that this special household electricity may be made available almost immediately.

* * *

Shortage of electricity in East Germany has led to drastic restrictions on its use. The causes of the shortage are said by the Bonn correspondent of the *Manchester Guardian* to be a lack of generators, faulty repairs and (unexpectedly) "over-eagerness of private householders to see during the hours of darkness." Special "electricity commissars" have been appointed to report householders "committing the inconceivable extravagance of burning two 60-watt bulbs at the same time." Maybe a further cause of the shortage is revealed in a statement made by the minister in charge of industrial production that "the supply of electric power is not a technical problem but primarily a political affair." There have been times when I have thought that this view was gaining ground here.

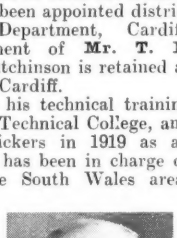
PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Metropolitan-Vickers Electrical Co., Ltd., announces that as from 1st October **Mr. A. J. Davies** has been appointed district engineer, Erection Department, Cardiff, following the retirement of **Mr. T. L. Hutchinson.** Mr. Hutchinson is retained as part-time consultant at Cardiff.

Mr. Davies received his technical training at the Glamorganshire Technical College, and joined Metropolitan-Vickers in 1919 as an erection engineer. He has been in charge of many contracts in the South Wales area,

Mr. A. J. Davies



Mr. T. L. Hutchinson

including turbo-generator installations and mining and rolling mill contracts, and in 1950 he was appointed assistant district engineer, Cardiff. Mr. Davies is a member of the Association of Mining Electrical and Mechanical Engineers.

Mr. T. L. Hutchinson joined the British Westinghouse Co. as a school apprentice in 1904. After holding various appointments he became district erection engineer, Cardiff, in 1918. He has been associated with many large contracts in the South Wales and South-West England areas, including the erection of the first eight 132 kV outdoor substations for the Central Electricity Board from Swindon to Swansea.

A. Reyrolle & Co., Ltd., have appointed **Mr. J. S. Hutchinson** as North-East England area manager in charge of all work within the territory covered by the North Eastern Electricity Board.

Mr. P. Evans has been appointed manager for the Scandinavian division of Hoover, Ltd. His headquarters will be in Copenhagen. Mr. Evans joined the company in 1949.

Mr. George W. P. Page, A.C.G.I., A.M.I.E.E., is retiring at the end of the year from the staff of the Publicity Department of the British Thomson-Houston Co., Ltd., Rugby. Mr. Page joined the B.T.H. Co. in 1923, having previously held editorial appointments on *Electrical Engineering* and in the G.E.C. Publicity Department. His chief responsibility has been the preparation of articles for the Press and, as Press liaison officer, he has made a wide circle of friends amongst the technical journals and lay Press, who join his B.T.H. colleagues in wishing him a happy retirement. His address is 15, Linden Avenue, Broadstairs, Kent.

Mr. N. F. Palmer, general manager of Electrical Equipment of Australia, Ltd., Sydney, N.S.W., and a director of the company's subsidiaries, Acelec Pty., Ltd., and B. & S. Electrical Pty., Ltd., tells us that he has recently returned from an extended business tour of the United States, Great Britain and the Continent. He visited many of his companies' overseas principals and switchgear companies, and obtained a number of new agencies. Arrangements were made with American concerns to extend manufacture in Australia under licence.

Mr. D. R. Mackie, director of Monsanto Chemicals, Ltd., and also general manager of sales, is to be commercial director of the company. The position of general manager of sales is to be discontinued, and the responsibilities of that office transferred to three sales controllers, **Messrs. E. L. Pixton, D. C. M. Salt,** and **J. S. Hunter. Mr. W. M. Thompson** is to be director of purchases.

Mr. H. Pryce-Jones, manager of the Mid-Sussex Sub-Area of the South Eastern Electricity Board, is the new president of the Brighton, Hove and Worthing Electricity Branch of the National and Local Government Officers' Association.

The annual general meeting of the Birmingham branch of the **Electrical Industries Benevolent Association** was held at the Imperial Hotel, Birmingham, on 4th December. The meeting was preceded by luncheon, at which some 100 persons were present. The chair was occupied by Mr. H. S. Davidson, chairman, and the meeting was addressed by Mr. C. F. Partridge, president of the

Birmingham Electric Club. The chief officers for 1954 were elected as follows: president, Mr. R. L. Batley, O.B.E., A.M.I.Mech.E. (divisional controller, B.E.A.); chairman, Mr. J. M. Surrall; hon. treasurer, Mr. H. J. Bick; hon. secretary, Mr. L. Wall (Electrical Components, Ltd.). The next social event will be the annual dance at the T.I. Social Club, Oldbury, near Birmingham, on 12th February, details of which will shortly be issued.

From 7th to 12th December the **G.E.C. Musical & Dramatic Societies** presented their annual pantomime at Magnet House, Kingsway, London, W.C.2. This year "Dick Whittington" was chosen and a very able company supported Barbara Ward in the title role. "Carter and Paterson," played by Bill Bulline and Jimmy James, provided an excellent comedy team, and the versatile Florence Scantlebury backed them most effectively. Special mention may also be made of Shirley Linge who, in addition to her part as Alice, had the opportunity of displaying her talent as an acrobatic dancer by playing "King Rat."

An industrial stoppage of a pleasant character occurred at the works of the Brighton Lighting & Electrical Engineering Co. recently. The employees handed in notice of a "one-hour strike" to celebrate the seventieth birthday of the managing director, **Mr. Ernest Heaps.** After a congratulatory speech by Mr. A. P. Cole, the general manager, a birthday cake was cut and distributed by Mrs. Heaps.

The first apprentices' presentation day was recently held by **Marconi's Wireless Telegraph Co., Ltd.,** at the Chelmsford works. Eighty-one apprentices were presented with monetary awards for outstanding work and on the completion of various courses. The presentation of awards was made by Mrs. F. N. Sutherland, wife of the company's general manager.

In our last issue we stated that Mr. E. C. Cross had been appointed joint secretary of the Plessey Co., Ltd. This should have read **Mr. W. F. Cross.**

The Six Hundred "25" Club, of the **George Cohen, Sons & Co., Ltd.,** group of companies, held its second annual dinner at the Strand Corner House, London, on 9th December. The Club has a membership of 332 and 240 were able to attend, among them being Mr. C. M. Cohen, chairman of the parent company and a founder member of the Club.

OBITUARY

Mr. J. Hogan.—The death occurred on 14th December of Mr. J. Hogan, export sales adviser to British Insulated Callender's Cables, Ltd., until his retirement a few months ago. Mr. Hogan joined the former Callender's Cable & Construction Co., Ltd., in 1902, and after serving an apprenticeship in various branches and offices he entered the Sales and Estimating Department in London, later specializing in overseas contracts. In 1923 he took charge of the Overseas Power Cables Department and later, on its formation, of the Overseas Sales and Estimating Department. Mr. Hogan continued to serve in this capacity until his appointment as export sales adviser.

Mr. C. J. B. Barlow.—The death is reported of Mr. C. J. B. Barlow, M.I.E.E., who was chairman of the Warrington Electrical Co., Ltd., which he founded in 1919. Mr. Barlow was born in Accrington in 1902. After training in the Colwyn Bay Electricity Department he went to Drake & Gorham, Ltd., and was later with Marryat & Place, Ltd. He was chairman of the Warrington Branch of the Electrical Contractors' Association from its formation until 1948, and was a former member of the E.C.A. Council.

Mr. A. Lane, chief supervising engineer of Hall & Stinson, Ltd., died on 27th November.

WILLS

Mr. P. E. Negretti, chairman and managing director of Negretti & Zambra, Ltd., who died on 20th September last, left £183,624 gross (£182,579 net).

Dr. L. F. Richardson, F.R.S., principal of Paisley Technical College from 1929 to 1940, earlier associated with experiments in the development of tungsten filaments for electric lamps, who died on 30th September, left personal estate in England and Scotland valued at £3,727.

Sir Archibald Rowlands, G.C.B., M.B.E., formerly Permanent Secretary of the Ministry of Supply, director of Aberdare Cables (Holdings), Ltd., Power Securities Corporation, Ltd., etc., who died on 18th August, left £5,138 gross (£3,988 net).

Mr. J. E. Edgecombe, M.I.Mech.E., M.I.E.E., first borough electrical engineer of Kingston-upon-Thames, and a former director of the Stearn Electric Co., Ltd., who died on 4th August, left £211.

Mr. A. Fraser, A.M.I.E.E., formerly a partner in Fraser & Borthwick, Ltd., who died on 21st October, left £671 gross (£605 net).

Mr. R. P. Giles, technical sales representative in the Midland, Eastern and South Eastern areas for W. Lucy & Co., Ltd., who died on 31st August, left £6,449 gross (£6,234 net).

Mr. D. Wineman, director, Luxram Electric, Ltd., who died on 7th November, left £26,730 gross (£22,625 net).

Mr. P. Finigan, formerly business manager of W. T. Glover & Co., Ltd., who died on 3rd August, left £7,126 gross (£7,033 net).

Conductive and Anti-Static Rubbers

Laboratory Tests Described in New British Standard

RUBBER is normally regarded as a material of high electrical resistivity, but the incorporation of various materials, such as carbon black, reduces the resistance greatly so that the volume resistivities between 10^{15} ohm/cm and 1 ohm/cm are obtainable. There are various technical and industrial purposes for which rubber with a reduced resistivity is a useful material, the most frequent application being for the dissipation of static charges. In certain circumstances a lower limit of resistance value must be imposed on a product with this latter application, as a safety precaution to prevent its ignition or to guard against shock to a person in contact with it, in the event of faulty insulation of nearby electrical equipment.

Products which, while conducting away static charges, are sufficiently insulating to fulfil the safety requirements above are termed "anti-static" rubbers and those which do not fulfil the safety requirements are termed "conductive" rubbers. Laboratory tests for both types of material are described in B.S. 2044 : 1953, "Tests for Resistivity of Conductive and Anti-Static Rubbers," which has just been published at 2s 6d by the British Standards Institution, 2, Park Street, London, W.1.

Since the dimensions of the product are involved it is not possible to define a suitable range of volume resistivities for either of these classes, but only a range of resistance values between defined points. The principal hazard, apart from static electricity, in most buildings and with most electrical equipment is from leakage currents from normal voltage supply mains. To guard against these hazards it is recommended that the lower limit of resistance for an anti-static rubber product should be 10^5 ohms. The maximum resistance which will dissipate static charges depends on the rate of generation of charge required to produce the minimum voltage which can be regarded as a hazard in a particular application.

The resistance of these materials is very sensitive to their strain and temperature history. The relationships are complex and arise from the kinetic energy and structural configuration of the carbon particles in the rubber. Under normal conditions of service with varying temperature and strain history the resistance of a sample of a given material can vary considerably, for example by a hundred or more times between strained material at room temperatures and material which has remained unstrained for a short period at 100 deg C. In order that valid comparisons may be made between test pieces a conditioning treatment is specified so that the measurements shall be made on test pieces reduced to a constant strain and temperature condition.

Certain types of electrode, when applied to these rubbers, have a contact resistance which may be many thousand times greater than the intrinsic resistance of the test piece. Dry contacts under light pressure or point contacts are particularly poor. To satisfy the various practical requirements for tests on laboratory prepared test pieces a variety of suitable electrode systems is described.

Bonded electrodes are suitable for all resistivities and give a negligible contact resistance. They are preferable when moulded test pieces can be prepared. A potentiometric method of similar accuracy suited to resistivities less than 10^6 ohm/cm is preferred when moulded test pieces cannot be prepared. Experimental difficulties become insuperable on highest resistivity test pieces but when used on test pieces within its range the system completely eliminates contact resistance effects. An electrode system of lower accuracy is also described which is intended for use when neither of the above methods can be used and it is suitable for all resistivities.

"Preferred Numbers"

THE series of standardized numbers known internationally as "Preferred Numbers" are finding increasing application in the preparation of standards and in the devising of ranges of products and processes. The B.S. 2045 : 1953 has been prepared with the objects (*a*) of giving authoritative status to these numbers for application, where appropriate, in British practice, and (*b*) of providing readily accessible information on the numbers themselves for those who may have occasion to use them. The Specification lists the preferred numbers in the four principal series (R5, R10, R20 and R40), as well as the additional R80 series intended for special application. These numbers are the same as those agreed internationally by the International Organization for Standardization (Technical Committee ISO/TC 19, Preferred Numbers) in New York, June, 1952, and now published as ISO Recommendation No. 7. For the series R5 to R40, the ISO recommendation is in exact accord with the earlier agreement of the ISA, as given in ISA Bulletin No. 11, 1935.

Copies of this Specification may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.I, price 2s 6d.

Industry and the House

Proposals for Atomic Energy Control Discussed

By A. M. F. PALMER, A.M.I.E.E., M.P.

SINCE I gave much space in my last article to the Lords' debate on television, it is unnecessary to return to the subject at length in connection with the two days' discussion in the Commons. This took place on a Government motion to approve their television policy. The outstanding features were the offer of the Labour Opposition to have all-party conversations and the remarkable feat of the Home Secretary who talked out his own motion.

Mr. Herbert Morrison suggested the all-party compromise. He thought it would be better if, instead of forcing the issue through the House with all the power of the Whips, Government and Opposition could meet "round a table" to try to arrive at general agreement. But Mr. Selwyn Lloyd, descending from foreign affairs to television, said for the Government that any such meeting would have to be based on two principles to which they were firmly committed; that the B.B.C. monopoly should be broken, and that any alternative system of television should draw, at least, some revenue from advertisements. And it was this same suggestion of Mr. Morrison's that Sir David Maxwell Fyfe, the Home Secretary, was dealing with when, absorbed in his arguments, he neglected to watch the clock.

Time Dispute

It is a rule of the House that a debate stands adjourned at a given time if no decision is made to take the vote. Unfortunately for him the Government Chief Whip, Mr. Buchan-Hepburn, was unable to move that the question be put for the substantial reason that the Home Secretary was still talking at the dispatch box. The general Press have already given an adequate impression of the amazing scene that ensued. It demonstrated how two bodies of partisans cannot easily agree on even an apparently detached matter like time. Electrical people will be interested to know that play was made with an alleged discrepancy between the clocks at either end of the Chamber. I was fascinated by this subtle point; actually both clocks are new, electrically driven, of the most modern construction and to my sight recording exactly the same time. In any case, it turned out that the reflections cast on the electric clocks were not only unmerited, but futile. Mr. Speaker uses a private chronometer—apparently a chaste mechanical device—and sustained by this machine he ruled, to the delight of Labour Members, that Sir David had indeed defeated himself for the evening.

What the Home Secretary was about to say finally on behalf of the Government about Mr. Morrison's offer was lost, for the vote was taken immediately when the debate was resumed the following night. But it seems that he was anxious to be more moderate than Mr. Selwyn Lloyd, and to assure the Opposition that there would be plenty of room for any practical suggestions they cared to make on control of religious and political issues and for supervision of financial and other details.

Atomic Energy Debate

Last Thursday week, at the end of the day, we debated the change of atomic energy control. As is well known, it is the intention of the Government to transfer responsibility for atomic energy from the Ministry of Supply to a new public corporation.

Mr. George Strauss, Labour's former Minister of Supply, said that the Opposition had no objection in principle to a corporation outside the Government machine administering any important public enterprise wherever this form of control was appropriate. But the Labour Party felt that the proposed new arrangement was inappropriate at the present stage of atomic developments: "it would create an

administrative mess." A substantial point was advanced by Mr. Strauss, when he said that the change would mean that the House of Commons would lose much of its direct control. He assured the House that the Opposition had the highest regard for the ability and judgment of Sir Edwin Plowden, who is to be chairman of the new corporation, but his services did not alone compensate for such a damaging upset.

Viscount Hinchingbrooke, who sits for Dorset South, and is always a stimulating and often original contributor to Parliamentary debates, argued that the proposal was a move towards peace and pacification, for we were showing the world, as America had done, that we were taking atomic energy away from national Government and hence putting it one stage further from the military authorities. But Mr. Maurice Edelman, Labour Member for Coventry North, countered this argument to a certain extent by pointing out that the new body could never be truly analogous to any of the existing nationalized industries which were genuine trading bodies.

Sir David Eccles, the Minister of Works, replied for the Government and argued that the proposal was a tribute to the Ministry of Supply. Most of us would feel that to have something taken from us because we are doing it so well is a somewhat back-handed compliment, but the Minister persisted with the point. He said it was precisely because British scientists and engineers had made such astounding progress under the Ministry of Supply that the Government believed the time had come to put atomic energy in the charge of a Cabinet Minister without departmental requirements for nuclear products. What was suitable for " an infant in arms " was not now suitable for a project " grown to manhood." Another compelling reason for the transfer of control was the competition between bombs and power stations for fissile material. Dealing with a point which the writer has raised himself in the House, Sir David said that if it were profitable to generate electricity using fissile material, the British Electricity Authority would do the work.

The Ministry of Supply would continue to be responsible for the manufacture of what the Minister called " the conventional parts of atomic bombs," but would order the fissile cores from the new corporation in the same way as Ordnance factories ordered explosives for shells. He thought that under the new arrangement they would be in a much better position to assess the proper balance between military and civil uses.

But Sir David did not seem to be on sure ground when dealing with parliamentary responsibility. After pointing out that the Lord President of the Council (Lord Salisbury) was, because of his office, the obvious choice as the responsible Minister, he was somewhat nonplussed when Labour Members cried " Not in the Lords "!

The hour was late and the Order put on for discussion at short notice; it was not surprising perhaps that the total votes were small, the Government easily carrying their point with a majority of 36.

Telephone Cable Agreement

Another matter of industrial and scientific interest dealt with late at night was when Mr. Gammans, Assistant Postmaster General, moved that the contract between the Government and the American and Canadian Companies for the provision, construction and maintenance of a trans-atlantic submarine telephone cable system be approved.

Mr. Gammans pointed out that it was ninety years ago that a transatlantic telegraph cable was first laid, but we had to wait until 1927 before there was any telephonic communication across the Atlantic. This present method still suffered from the handicap of interference from atmospherics, meaning usually that communication was only possible for, say, two-thirds of the twenty-four hours.

On this side of the Atlantic there would be a new cable station near Oban in Scotland. From Oban to Newfoundland the cable would be fitted with repeaters of American design. This was because the Americans had had greater experience than the British of deep sea cables. But between Newfoundland and Nova Scotia the cable would incorporate repeaters of British type. The last link in the chain was to be a micro-wave radio relay system from Nova Scotia to the United States-Canada border, where the system would link with the normal United States telephone service.

Mr. Ness Edwards gave the Opposition's blessing to the scheme, and said that they were delighted to think that the biggest cable ship in the world, *Monarch*, would lower the line to the sea bed.

PARLIAMENTARY NEWS

By Our Special Reporter

IN reply to questions by Mr. Ian Harvey and Mr. Geoffrey Hirst, the Assistant Postmaster General (Mr. Gammans) said it was not the practice to give forecasts of B.B.C. expenditure, but the published accounts for 1952–53 showed that the cost of the television service during that year was £4,334,474, of which £933,432 was for capital additions and £3,401,042 for revenue expenditure. The income of £1,679,007 from television licences represented 15s 9d per licence; the Corporation would have needed £2 0s 8d per licence to cover its total television expenditure. To give the Corporation this sum per licence would have meant raising the £2 broadcast receiving licence fee to roughly £3 10s.

Mr. Gilbert Longden asked the Assistant Postmaster General whether he would insist on an inquiry by an independent body to see what economies could be made within the B.B.C. before he considered their request for an increase in the licence fee to be charged to the public.

Mr. Gammans said that the B.B.C.'s capital investment was subject to the normal machinery of Government control, but in the matter of day to day expenditure, successive Governments had allowed the Corporation full autonomy, subject to periodical investigations by outside committees. The most recent of these, the Beveridge Committee, which exhaustively examined all aspects of the B.B.C.'s working, gave high praise to the way in which the Corporation kept a "grip on income and expenditure."

Electricity Charges

Mr. Leslie Thomas asked the Minister of Fuel and Power if he would give a direction to the British Electricity Authority, under Section 5 of the Electricity Act, 1947, that it should make uniform charges for electricity to all Area Boards. Sir Alfred Bossom asked a similar question.

Mr. Joynson-Hicks said that the charges to each Area Board varied according to the cost of the coal used in the generating stations in that area. The Minister was not prepared to direct that this practice should be altered.

Television Policy

During the House of Commons debate on competitive television, Mr. Gammans referred to the Government's policy with regard to the clearance of Band III. In this band there were eight channels: only two of these were immediately available, and they would be allotted to the new public corporation. The rest of the space was being used by taxi-cabs, ambulances and public utilities, and also for aeronautical aids. The Television Advisory Committee had recommended that the whole of the band should be cleared for television, and this recommendation the Postmaster-General had accepted. This would, of course, take some time, but the rate at which the band would be cleared must depend upon the development of television in this country and the time required to move the services themselves.

All licence-holders in this band were warned, when their licences were issued, that it might be necessary for them to change their frequencies. The new adaptors would cost from £6 to £15. The radio industry now had at its disposal the necessary information for designing and producing these adaptors, and for manufacturing new sets which could receive more than the present programme.

There was no question whatever of the public corporation, at its inception, providing more than a 50 per cent coverage. Although the sites for the new stations had not yet been finally decided, London would certainly be one of them, and it was probable that Birmingham and Lancashire would be the other two. These were not only very concentrated centres of population, but they also lay on the main coaxial cable and radio routes that ran northwards from London, and therefore they could be provided with linking-up facilities at the minimum of capital cost.

This limitation of stations in the first instance did not, of course, mean that other parts of the United Kingdom will be excluded. The public corporation would have the power, with the permission of the Government, to build new stations, and could use its surplus revenue for this purpose, to diminish the need for future borrowing.

Board's 200,000th New Consumer

THE North Western Electricity Board has connected up its 200,000th new consumer and to mark the occasion a ceremony was arranged at the home of the consumer. After the Lord Mayor of Manchester (Ald. Abraham Moss) had fitted a fuse to inaugurate the supply, Sir Joseph Hallsworth, chairman of the Board, presented the new tenants, Mr. and Mrs. J. Greenhalgh, with an electric kettle and a pressure cooker. He spoke of the important part which electricity could play in overcoming the problem of atmospheric pollution.

Atomic Power Stations

House of Lords Debate

OPENING a debate in the House of Lords on the future organization of the United Kingdom Atomic Power Project (see *Electrical Review*, 20th November), Lord Falmouth, while welcoming the setting up of a separate corporation, criticized many provisions of the scheme. Referring to the decision to build a power station of about 50 MW at a cost of £6 million (including £1 million on nuclear fuel), he said that the corresponding cost of a traditional station would be approximately £2·5 million and would have a thermal efficiency of 30 per cent compared with 20 to 25 per cent of the proposed atomic station. He regretted that the head of the corporation would not be a scientist or an engineer.

Lord Salisbury (Lord President of the Council) replied that the board would be an executive and not an advisory body and would be composed of leading technical experts, but its chairman required the wider administrative experience that was outstandingly possessed by Sir Edwin Plowden. The accelerating rate of consumption of existing fuels was fantastic and atomic energy (particularly through the development of the "breeder" reactor) seemed the only means of overcoming shortages of energy. In the United States one half of all coal ever burned had been consumed since 1920 and the same proportion of oil and gas since 1940. In the whole world the annual "burn up" was ten times the amount of a century ago and by 2000 A.D. might be four times the present figure.

Electricity Generation

The only foreseeable way of using the fission processes was in the production of heat for raising the steam required for generating electricity for the grid. The main objects of the project over the next 30 or 40 years were to meet the rapidly growing demands for electricity without imposing intolerable additional burdens on the coal industry and to make available for export and other purposes some of the 30 to 40 million tons used annually in generating electricity. Even if atomic fission could produce free steam, however, the average cost of electricity to consumers would sink only from 1·3d to 0·9d a kWh. The cost of electricity from the Calder Hall plant would apparently be about 1d/kWh, delivered to the grid, but the lower capital cost of improved later models might confidently be expected to enable electricity, at some as yet undetermined time, to be generated as cheaply or more cheaply than by coal. Progress would partly depend on decisions as to the proper rate of capital investment, but if the programme under examination could be realized by far the greater part of the country's electricity was expected to be generated from atomic power by 2000 A.D.

Lord Waverley (chairman of the committee on whose report the White Paper was based) referred to the need to keep a balance between the different applications of nuclear energy (e.g., military, industrial and biological), which he believed could not be done under the Ministry of Supply. The Corporation would be preferable to the alternative of a new Government Department.

"Approach to Russia"

IN our leading article of 11th December bearing this title we referred to adverse comments by the President of the Board of Trade and the Foreign Secretary upon the British Council for the Promotion of International Trade. This Council draws our attention to Press statements which it made after Mr. Eden's remarks in which it emphasized that it was concerned only with questions of trade and commerce. The Council claims that a visit of business men to China which it organized resulted in orders for this country of the value of £7 million and other similar instances concerning other countries are mentioned.

The Council says that the statement that it is interested solely in developing Britain's relations with Communist countries does not bear examination. "The idea that the British Council is in any way concerned with political matters is completely without foundation."

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Legislation and Metering Costs

I WAS present at the I.E.E. discussion on "The Influence of Legislation on the Costs of Metering" (reported in your issue of 11th December, p. 1341) and thought that a number of the arguments were put forward to give the impression that meter testing and certification were very heavy burdens for the Boards to carry. Let us examine the facts more closely and consider these costs on a single domestic meter basis.

The price of a single-phase meter to-day is £3 2s 6d and from a depreciation point of view can be given a life of 30 years. If a "certification life" of 15 years is assumed, this meter would only have to be changed once during the 30 years for repair, test and re-certification due to legislation. Over the whole of this 30-year period therefore the cost *per annum* of metering for a domestic consumer would approximate to the following figures:—

	s.	d.	Cost per annum s.	d.
Interest (5 per cent) and depreciation			5	3
Initial test and certification ..	7	6		
Initial fixing	15	0		
Change cost after 15 years ..	15	0		
Repair, test and re-certification	25	0		
Total cost over 30 years ..	62	6	2	1
			7	4

If we agree that a meter is a necessity and must be fixed on the consumer's premises but assume that all other costs (including the initial test) are wholly due to legislation, then the very most which can be assigned to this cause is 1s 7d per annum. If metering were to be abolished—as one speaker suggested—then the saving per quarter would amount to 1s 10d per consumer.

I find it hard to believe that anyone could assert that the average quarterly bill of £2 costs 7s 6d to collect, owing to legislation. By far the largest part of any cost incurred in collecting Boards' revenues arises from meter reading, billing, postage, etc., items which have nothing to do with legislation.

"CATHAY."

Loss of Units

MR. PHILIP HONEY in his letter in your issue of 27th November, rightly deplores the substantial loss of sales, which he estimates at between 30 and 40 million kWh per annum, due to our industry losing traction loads. I would like to put forward one suggestion to recover these units.

We are told that there are 180,000 employees in the British Electricity Authority, which, roughly speaking, can be taken to represent, say, 160,000 homes, whether the employees have their own homes or live with their parents. I doubt very much whether any accurate information is available to tell us the number of those employees who have electric cooking. My estimate is not more than half of them use their own product for cooking purposes. It is generally agreed that the connection of a cooker to the supply is likely to result in the sale of 1,000 kWh per annum. Therefore, on this basis, there is a potential sale of 80 million kWh annually for cooking purposes alone, so even if my rough estimate is double the actual figure, it is still possible to recover in this way the whole of the 40 million kWh lost in traction supply.

It is appreciated that employees cannot afford to buy all the many excellent appliances which are available, but every home must have some form of cooker whether it be solid fuel, oil or gas.

In most parts of the country to-day, if not all parts, electric cooking is cheaper than gas cooking, so it is surprising that we

are unable to convince our own staffs on this score alone. In any case such a state of affairs indicates a regrettable lack of loyalty to the industry which provides a means of livelihood.

The first solution which springs to mind to deal with this problem, is the availability of a "staff tariff," but it would be most interesting to have readers' views, especially any of those who have endeavoured to tackle this question.

"NOMAD."

Care of Premature Infants

Electrically Heated Equipment

RETURNS from the Registrar General show that every year in Britain 4,000 premature babies die from various causes. A portable heated unit now being made will help to reduce the fatalities occasioned by exposure on the journey from the place of birth to the hospital. At the same time improvements have been made to new hospital apparatus which mark a considerable advance in the technique of rearing the premature infant. Both sets of apparatus have been designed in consultation with leading pædiatricians by Oxygenaire (London), Ltd., and have special G.E.C. heating elements.

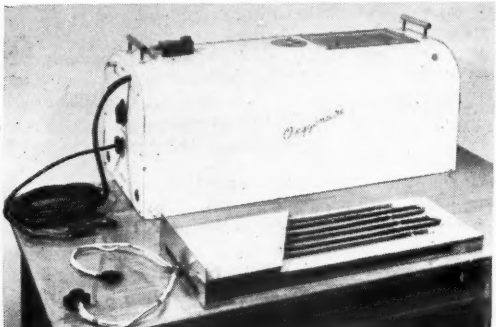
The unit will be held ready at ambulance stations and hospitals to meet any emergency call. It will be kept at the optimum temperature from the mains supply, as will the sterilized wraps for the infant which are kept in the tray of the incubator. Once in the ambulance it is connected to the 12 V vehicle battery, and temperature is maintained thermostatically. On arrival at the home the unit, which can be carried by two persons, is quickly taken to the bedroom where the baby is wrapped in the pre-heated clothes and placed in the incubator. Within minutes the incubator is plugged into the ambulance batteries once more and taken to hospital.

The interior of the unit is lighted and the oxygenated atmosphere is kept to temperature by elements mounted in a sealed cylinder. Because of the extremely low loading required per foot, the 500 W mains element is 80in long. Two 30 W elements operate on the 12 V battery circuit.

Once in hospital, the baby is transferred to a more elaborate Oxygenaire incubator little bigger than an ordinary cot where it remains until sufficiently mature. Access to the infant is through a hinged transparent plastic lid fitted with adjustable dampers so that it can either move freely or be held in any position. A fixed panel at the front prevents the over-rapid loss of oxygen when the lid is opened. Instruments are provided for the observation of temperature and humidity and provision is made for the extraction of air samples for gas analysis without having to open the lid.

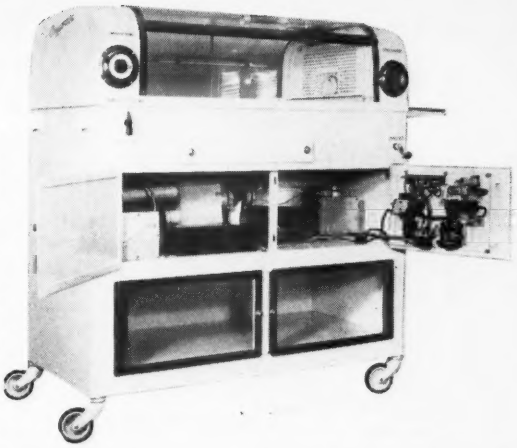
The incubator can be used with or without oxygen or with an air/oxygen mixture. As the oxygen system is arranged to provide sufficient air circulation of itself it can also be used independently of the mains supply as an oxygen tent with a humidifier. It can be operated at any oxygen concentration from 30 per cent to over 80 per cent. A controllable air intake is provided and filtered air can be mixed with the oxygen supply as desired. The infant can therefore be transferred gradually from oxygen to air without affecting the temperature.

Although there is no direct heating of the treatment chamber and all warmth derives from the air circulation, its temperature is controlled within 0·5 deg F. Heat is applied in stages to the air/oxygen mixture which then passes through the humidifier, the amount of moisture collected being controlled manually. The conditioned air then enters the



The portable incubator with a cut-away of the heating cylinder showing the heating elements

The more elaborate Oxygenaire incubator for hospital use



treatment chamber through the left-hand grille and passes slowly across to the other end where a small degree of suction ensures the completion of the circulation. The heating elements are nickel plated against atmospheric corrosion and silver soldered.

A pull-out tray below the cradle is placed so that an X-ray pack may be placed under the infant without removing it from the incubator. Covered apertures are provided at each side of the lid to allow the passage of tubes for drip feeds and blood transfusions. A baby already receiving a blood transfusion can be put into the incubator without disconnecting the tube; similarly, opening and closing the lid causes no interference with a transfusion that has been set up already.

To prevent overheating of the treatment chamber an excess temperature cut-out is included in the heating circuit. If the temperature rises above 105 deg F the cut-out will shut off the heaters and a red button on the front panel will spring out. At the same time a red light on the panel flashes until action is taken. A battery operated warning bell rings if failure of the mains supply occurs or if the incubator fuses burn out.

Research Development Corporation

THE fourth annual report and statement of accounts of the National Research Development Corporation for the year ended 30th June last has just been issued (H.M. Stationery Office, price 9d).

After four years' working the Corporation is a party to over 250 licence agreements with industry in this country or abroad, and to revenue sharing agreements entered into with universities, university research workers and industrial research associations. These involve administration of 2,224 patents and patent applications at home and overseas. This administration, together with the yearly accretions to the Corporation's portfolio of patents, involves the Corporation in a continuing commitment in respect of wasting assets with a maximum life of around 16 years. The running expenses of the Corporation for the year 1953 totalled £120,790, as compared with £83,556 for 1952 and with £20,581 for 1950, whereas the receipts for 1953 totalled £23,333 as compared with £25,676 for 1952 and with £3,029 for 1950.

Among the development projects with which the Corporation is concerned is electronic digital computers. These continue to represent the Corporation's largest single commitment. Work on the four large machines commissioned by the Corporation, referred to last year as similar to that designed by Professor F. C. Williams, F.R.S., at Manchester University, was well advanced by 30th June last, and commercial orders, one of which was for export, had been received for three of them. Delivery or deliveries will be made during the course of 1953–54.

In addition, the prototype of a smaller machine mentioned in the Corporation's last report has been delivered and was exhibited at the Physical Society's Exhibition during 1953. This machine has been temporarily installed in the University Mathematical Laboratory at Cambridge for trials. Support of work in this field at the Mathematical Laboratory at Manchester University continues, and in addition grants have been made to both Cambridge and Manchester Universities for the purpose of training engineers and mathematicians in the design and use of computing machinery.

Short-Circuit Protection

Simple Approach to Low-Voltage Installations

By R. L. MARRS, B.Sc.

IN the initial stages of the design of any electrical installation, it is essential to have some knowledge of the value of the fault currents under short-circuit conditions, in order to choose switch- and fuse-gear of suitable rupturing capacities. Few engineers feel confident of reaching a correct conclusion after delving into the mysteries of symmetrical components, but the following example, taken from an actual installation, may give the reader a more simple approach to the subject.

A factory requiring a 500 kVA transformer to supply its electrical requirements was situated about six miles from an important h.v. switching station which was part of the supply authority's system (Fig. 1). Thus it appeared reasonable to assume infinite busbars at the h.v. terminals of the transformer; i.e., that an unlimited supply existed at the h.v. side of the transformer and that the only impedance in the circuit under fault conditions would be that of the transformer (see Fig. 2).

The table gives the percentage impedance (% Z) for a transformer of this rating as 5·9 per cent. Now by definition.

$$\% \, Z = \frac{\text{kVA base} \times 100}{\text{Fault kVA}} \quad \ldots\ldots\ldots \quad (1)$$

The base in this instance is the rating of the transformer, therefore the fault MVA at the l.v. transformer terminals =

$$\frac{500 \times 100}{5{\cdot}9 \times 1{,}000} = 8{\cdot}48 \text{ MVA.}$$

This formula can be written as

$$\text{Fault MVA} = \frac{\text{Rating of transformer in kVA}}{10 \times \% \, Z}$$

where % Z is the percentage impedance of the transformer concerned.

As is usual, the supply authority was asked to calculate the probable fault MVA at the consumers' terminals and a figure of 8·18 MVA was obtained, confirming the assumptions made above.

The figure derived from the formula is the maximum fault current under the worst possible conditions, i.e., a " phase-to-phase-to-phase " short circuit. Taking into consideration what is known of the h.v. supply system it is usually possible to assume a fairly accurate value of the actual fault MVA. This may be anything from 70 to 100 per cent of the figure obtained using the formula for transformers at the end of long h.v. feeders to those near generating stations and large switching stations.

Border-line cases should always be referred to the supply authority which has the information necessary to make more accurate calculations. For example, an engineer obtaining a result of 10 MVA would be uncertain whether to use equipment rated at this figure or the next highest, i.e., 15 MVA. The table gives typical figures for transformers feeding l.v. installations, but it should be pointed out that these will vary to a slight extent for different manufacturers.

B.S. 936 : 1940 details the rupturing capacities recommended for oil circuit breakers operating on alternating current circuits up to and including 660 V. These are 10, 15, 25 and 30 MVA.

It will be found that most switchgear manufacturers make o.c.b.'s suitable for two of these ratings, the lower value usually being 10 MVA and the maximum 25 MVA. It is seldom necessary to cater for faults exceeding the latter except when the installation is fed by two transformers

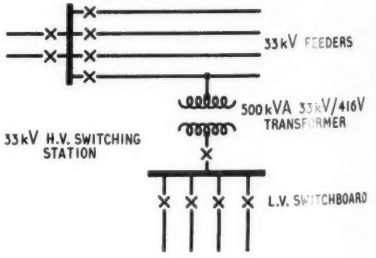


Fig. 1

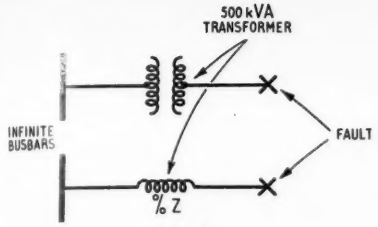


Fig. 2

in parallel when the total impedance is half that for one transformer, doubling the fault MVA. In such an instance it is usual to split the installation and operate as for two separate systems.

Although more expensive, h.r.c. fuses are always preferable to the rewirable type; they are not only free from deterioration and capable of giving good discrimination, but have a much higher breaking capacity than rewirable fuses. Most firms make a range of fuses rated to comply with Category AC4, B.S. 88 : 1952, i.e., capable of breaking faults up to 25 MVA. It is also possible to obtain fuses capable of dealing with faults up to 35 MVA, although these are seldom used except for special applications.

Fig. 3 shows typical characteristics for 60 A and 100 A AC4 h.r.c. fuses. It should be noted that these vary slightly for different manufacturers and for this reason it is extremely bad practice to use fuses of different makes in one installation. The reason for this is illustrated by the following example. Fig. 4 shows a fuseboard fused at 60 A with manufacturer A's fuses. It is fed from a switch fused at 100 A with manufacturer B's fuses. It will be seen from Fig. 3 that for fault currents over 550 A the 100 A fuse will break first, resulting in the isolation of both 60 A feeders. It is therefore obvious that a mixture of fuses could give very unsatisfactory discrimination.

PERCENTAGE IMPEDANCES

Rating of transformer in kVA. Voltage ratio 33kV/416 V	% Z	Fault MVA assuming infinite busbars at h.v. terminals	Recommended rupturing capacity of o.c.b.in MVA (B.S. 936: 1940)	Category of duty of h.r.c. fuse (B.S. 88 : 1952)
50	3·9	1·28	10	AC2
100	4·6	2·17	10	AC2
200	4·6	4·35	10	AC3
300	5·6	5·36	10	AC3
500	5·9	8·48	10	AC3
750	5·8	13·0	15	AC4
1,000	6·0	16·7	25	AC4

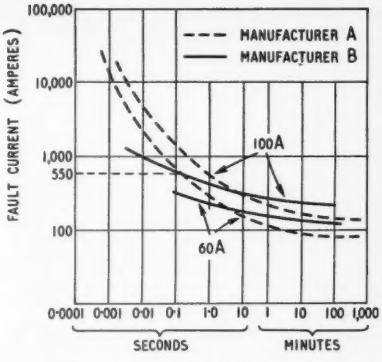


Fig. 3

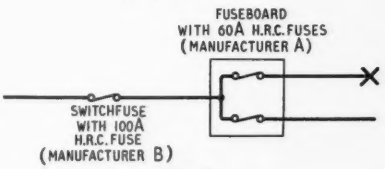


Fig. 4

It will have been noted from this article that it is not always necessary to use equipment rated as high as 25 MVA and it is technically sound to use gear of lower rating with a resulting saving in cost and sometimes space.

Export Trade Difficulties

BOTH Mr. Heathcoat Amory, Minister of State, Board of Trade, and Mr. L. C. Gamage, president of the Institute of Export, said that this country was losing overseas orders because prices quoted were higher than those of competitors. The occasion was the Institute of Export's annual dinner in London on 16th December. Mr. Gamage said that our high costs were largely caused by excessive taxation and some alleviation was essential. Constant demands for higher wages also made it difficult for exporters to quote firm prices.

Mr. Heathcoat Amory said that the Government was concerned not because our exports were unsatisfactory but because they were not good enough. While there was no reason for alarm and despondency there was cause for anxiety. There must be still greater efforts to improve our export trade and earn sufficient surplus to pay our way.

Lifts for Block Dwellings

Discussion on I.E.E. Paper

OPENING the discussion on the I.E.E. paper entitled "Electric Lifts in Post-War Housing" (*Electrical Review*, 11th December), Mr. R. A. Marryat (Marryat & Place) said that he doubted the necessity for the expense and complication of fully power-operated lift doors. Simpler devices were available by which doors were normally opened and closed by passengers, but if left open would be closed by power a certain time after the cage had been vacated.

Mr. Forbes Jackson (L.C.C.) mentioned that since the war his authority alone had ordered 1,200 of these lifts, and the demand from other parts of the country had been very high. Up to now there had been no serious accident. He wondered whether in this country we were becoming too accident-conscious, in view of the "paternosters" with open cages used on the Continent.

Experience in Birmingham

Mr. F. H. Jones (Senior Architect, Birmingham) referred to the value to architects of the concentration in one paper of so much information on all the principal factors in the design of lifts for housing schemes. In Birmingham lifts installed since the war conformed to the specification given in the paper; the difference was staggering, not only in greater efficiency and ease of maintenance but in the appreciative attitude of tenants. For a block of 30 flats, in which the building cost £60,000, the lift cost only £3,000.

Mr. S. A. Ghalib (Metro-Vick), while suggesting the use of higher speed lifts, pointed out that the maximum acceleration and deceleration consistent with the comfort of passengers was not achieved with the orthodox type of control. With a closed loop control or servo control, however, the speed of the motor could be controlled over a range of 50 : 1.

Mr. R. H. Lane (Ministry of Works) agreed with the elimination of the stop button, which when used to stop the car between two floors caused trouble with the electrical equipment. The paternoster did away with difficulties in fitting automatically-operated car and landing doors without appreciably reducing safety. He believed that one firm in this country was making paternosters.

Mr. W. A. Dixie suggested that the Ministry, which granted the subsidy, should promote standardization of lifts throughout the country. A B.S. to cover the type of lift described in the paper would facilitate its general acceptance. Specifications for steel wire ropes and travelling cables needed revision, and American practice in lift equipment should be considered.

Mr. G. Waters remarked that great care was taken to ensure the functioning of the alarm bell, but who came if the alarm bell rang?

Mr. T. H. L. Mills said he had found that carbon shoes eliminated most of the wear caused by dust. With one pair of shoes in use for four years the only trouble had been slight rusting on the guides due to condensation.

Mr. L. F. Hammond (Hammond & Champness) suggested that for lofty buildings collective control would be necessary by which calls were registered from the lower floors from which the car picked up passengers in its descent.

Mr. F. A. Law urged the provision in blocks of flats of a communal anti-radio-interference aerial system.

R.S.A. Endowed Prizes

THE Royal Society of Arts, as trustee for the relevant endowments, offers the following prizes during 1954:—Benjamin Shaw Prize of £20 for industrial safety; entries may be in the form of descriptive essays or models. Fothergill Prize of £20 for fire prevention or fire-fighting, for a descriptive essay or model embodying some new idea for the prevention or suppression of fire. Howard Prize of £20 for a treatise on some aspect of the subject of mechanical motive power. Entries must be received by the secretary of the Society, 6–8, John Adam Street, Adelphi, London, W.C.2, not later than 31st July next.

DEVELOPMENTS IN BRAZIL

From Our Rio Correspondent

PRESIDENT VARGAS has approved the Brazil–United States Commission's recommendation to raise the capacity of the hydro-electric station, now being built at Salto Grande do Santo Antonio, in Minas Geraes, from 50,000 to 100,000 kW. The project forms part of the programme for increasing installed plant capacity in the rich mineral zone of Central Minas Geraes and in the western part of Sao Paulo. The station is being erected by Centrais Electricos de Minas Geraes (CEMIG), a limited liability company which controls the Companhia Alto Rio Grande and three subsidiaries. The majority of the shares are held by the State Government.

The Sao Paulo Legislative Assembly has authorized the Executive to acquire diesel generator equipment, valued at £400,000, for State hospitals and schools.

The Brazilian subsidiary of the Dutch Philips Company is building an electric lamp factory at Sao Paulo, to be completed in eighteen months.

Proposed Trolley-bus Services

Trolley-buses are to be operated in the Rio de Janeiro Federal District by a "mixed economy" society, in which the Municipality will hold the majority of the shares. The first lines will serve the suburbs and be gradually extended to the centre of the city. According to the project cars will carry up to 100 passengers, some standing, and tariffs will be fixed mid-way between those of the present buses and the tramways.

Mr. Henry Borden, C.M.G., Q.C., president of the Brazilian Traction Light & Power Co., in a recent speech before the American Chamber of Commerce in Sao Paulo, dealt with the charge that failure to plan ahead was the cause of the present power shortage in Rio and Sao Paulo. He pointed out that, although the company had not been permitted to raise tariffs since 1939, except by 44 per cent to meet wage claims, and costs of living were now five or six times higher, it had increased installed capacity from 540,000 to 963,000 kW and a further 790,000 kW would be available early in 1956 (see *Electrical Review*, 5th June, 1953). Expansion in the Rio-Sao Paulo area had, in fact, been greater than the total expansion in the rest of Brazil.

In addition to hydro-electric installations, the Canadian Company kept telephone systems, with 525,000 instruments in service, in the Federal District, and the States of Rio, Sao Paulo, Minas Geraes and Espirito Santo. It supplied gas to the cities of Rio, Sao Paulo and Santos, and operated tramway services in the Federal District. Its total investment in Brazil exceeded $700 million (U.S.) at the end of 1952.

Notable Expansion

When the company began operating in Sao Paulo in 1900 two 500 kW generators supplied power for the first tramways, but by 1901 the Parnaiba hydro-electric station was serving the city's 240,000 inhabitants. Since then the population had increased tenfold, while hydro-electric potential had been multiplied 600 times. Although the company served less than 1 per cent of Brazilian territory, its plants represented more than 50 per cent of the total installed hydro-electric capacity.

Between 1938 and 1952, Mr. Borden said, the company's installed electrical capacity was nearly doubled, the number of consumers increased by over 100 per cent, telephones in service by more than 150 per cent and the supply of gas doubled. During the war years supplies of equipment from abroad practically ceased, interrupting normal development. Between 1946 and 1952 the company's investment was raised by $360 million, of which $110 million was obtained in the United States. In 1953 the three power stations now being built would add a further $30 million to capital expenditure.

Despite this considerable expansion there was still a drastic shortage of generating capacity (aggravated by the prolonged drought) and a scarcity of telephones. The

company was not entirely master of its destiny. It depended on exchange availabilities for imports and on long-term foreign loans. Between 1953 and 1962 the estimated expenditure for the work planned was equivalent to $1,500 million for electricity, telephones and gas and 75 per cent of this sum would be spent on electric power.

The company's policy, Mr. Borden concluded, was to transform its subsidiaries into Brazilian societies. So far, this had only been possible in one or two cases, but they had decided to convert the Sao Paulo Light into a Brazilian company, and the operation should be completed by the end of 1953. It was intended, early in 1954, to offer the Brazilian public an opportunity to acquire shares in the new company. They had already begun to carry out their programme of transforming the Companhia Telephonica Brasileira into Brazilian societies. One of these was recently formed to take over the assets of the existing Canadian company in Minas Geraes. Those in the State of Sao Paulo were now being dealt with and later the Telephone Company in the Federal District and State of Rio would be converted.

The tariff question came into all these matters, Mr. Borden said. For a large-scale financial programme to succeed in Brazil, public service companies must be guaranteed a reasonable return on capital in order to allow them to compete in financial markets. As there was a permanent need of successive financing operations a stable share market was essential. This implied continuity of adequate revenue to avoid share depreciation and undoubtedly called for a higher level of tariffs than those now in force.

Import Trade

Brazilian imports of electrical machinery and apparatus increased again last year. The values of the principal items were as follows, the 1951 figures being given in parentheses:—

Accessories for radio installations, £4,896,740 (£7,459,780); receiving and transmitting sets for radiotelegraphy and telephony, £3,189,040 (£1,713,240); electric lifts, £2,368,180 (£1,662,880); motors and generators, £12,720,940 (£8,575,180); accessories for electrical installations, £5,058,040 (£4,068,780); static transformers, £3,423,780 (£2,859,120); unspecified electrical machinery and apparatus, £11,190,620 (£11,027,860).

The above list does not include industrial machinery, although electrically operated, nor electric refrigerators and similar equipment. Imports of these two classes amounted to £106,009,720 and £2,013,880, respectively, in 1952, as compared with £88,405,180 and £2,973,260 in 1951.

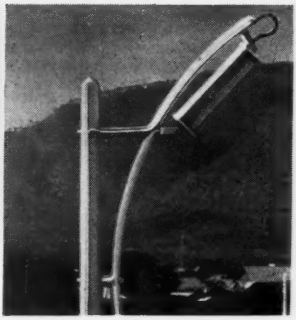
Imports from Great Britain in 1952 included telephone and telegraph apparatus, £754,714; accessories for radio installations, £497,639; domestic electrical apparatus, £23,709; electromedical apparatus, £70,349; refrigerators and accessories, £261,184; and pumps, £304,220. The total value of imports from Great Britain amounted to £63,584,860 in 1952, compared with £63,166,560 in 1951.

Great Britain's share of Brazil's total imports amounted to 8·49 per cent in 1951 and 8·55 per cent in 1952, while Germany's proportion increased from 5·5 per cent in 1951 to 9·28 per cent in 1952. Licences to import British goods were progressively curtailed after July, 1952, and a considerable drop in exports to Brazil must be looked for in 1953. Anglo-Brazilian trade is seriously threatened by Britain's reluctance to purchase at Brazil's high prices, which are boosted by inflation and the widening gap between the internal and external values of the cruzeiro; by the growing volume of Brazil's sterling debt and by the lack of a trade agreement.

The new exchange law may enable Great Britain to increase purchases in Brazil, particularly if its scope is widened, as it is expected to be shortly. Hopes are also expressed in British and Brazilian circles that the negotiations, about to be opened, somewhat belatedly, in Rio will find a way out of the impasse. Brazil has reciprocal treaties with Japan and twelve European countries and her foreign trade is now largely based on these agreements.

Alexandra Palace Railway

Because the number of people at present using the Finsbury Park to Alexandra Palace railway is small, the British Transport Commission proposes to withdraw the present passenger services and abandon the plan to electrify the line. The expenditure already incurred on electrification is stated to be approximately £300,000, but a proportion of this amount is recoverable.



Fitzroy Bridge, Queensland, and (right) one of the new B.T.H. fittings

Modern Road Lighting

THE recently opened Fitzroy Bridge at Rockhampton, Queensland, is believed to provide the first example in Australia of the use of fluorescent lamps for street lighting. B.T.H. SL3500 type lanterns, each of which houses two "Mazda" 40 W 2ft fluorescent lamps, have been mounted on standards at an angle of 45 degrees. These lanterns consist essentially of a central backbone carrying two cast aluminium end plates and the control gear and lamps. A clear "Perspex" shell totally encloses the whole assembly and fits into rubber gaskets on the end plates. Light control is by an anodized aluminium reflector. All the lamp auxiliary gear is assembled in the lantern and, after erection, it is only necessary to connect the supply leads to the connector block provided. New lamps can be inserted, and cleaning operations carried out, simply by unscrewing the end lug and removing the cast end-cover; the same end-cover gives access to the two starter switches. These lanterns are operating completely satisfactorily under local tropical conditions. Similar types are already in use in large numbers in Singapore.

The Southern Electricity Board has recently completed a lighting installation along part of the A419 road (Hungerford to Cirencester) through the centre of SWINDON. The 140 W sodium lamps in "Golden Ray Mark III" lightweight lanterns are mounted on steel columns. Totally enclosed with reflector and refractor control, the lanterns give a broad, non-axial light distribution. The lamps, lanterns and control gear were supplied by Siemens Electric Lamps & Supplies, Ltd., and the installation was planned by the Swindon Corporation Engineering Department under the direction of the borough engineer.

Part of the Hungerford-Cirencester main road at Swindon illuminated by sodium lamps in "Golden Ray Mark III" lanterns

Planned Improvements

SMETHWICK'S improved main road lighting is to be extended to 16 of the more important secondary roads in the town. The Town Council has accepted the tender of the General Electric Co., Ltd., to supply and erect prestressed concrete columns and special lanterns for £13,703.

Conversion of more city centre streets from gas to electric lighting has been approved by BIRMINGHAM Public Works Committee. The

change-over, which is part of a large conversion programme to be spread over approximately ten years and for which £5,000 was included in this year's estimates, is being made on the grounds of cheapness and efficiency. The existing system of mercury discharge lighting in Navigation Street and Hill Street is to be extended to cover the whole of these thoroughfares, while the same method of lighting will be installed in John Bright Street, Station Street and Worcester Street. Vertical fluorescent lighting is to be used in Edmund Street, Margaret Street, Eden Place, Stephenson Place, Ethel Street and Lower Temple Street. A number of other central streets are to have tungsten filament lighting.

Street lighting improvements to be carried out at BATH include the extension of the sodium lighting along the London Road from Cleveland Bridge to the Paragon. Similar lighting is to be provided in Charlotte Street. Queen Square and part of Gay Street are to be fitted with Georgian type lamps to blend with their surroundings.

The MIDDLESBROUGH Watch and Licensing Committee is recommending the Town Council to spend £4,530 to improve lighting along Corporation Road and part of Newport Road. On some sections fluorescent lighting will be used, and on others sodium vapour lamps.

LEICESTER City Council is to spend £47,651 during the next five years on improvements to main road lighting.

BARKING Corporation is recommended to approve schemes for the provision of street lighting at the London Road–Bennington Avenue estate.

BOOTLE Corporation Works Committee is to submit to the Ministry of Transport and Civil Aviation for approval a modified scheme, estimated to cost £2,900, for street lighting on part of Dunnings Bridge Road.

ELSTREE R.D.C. is recommended to seek sanction to borrow £1,853 to cover the cost of erecting twelve street lamps at Black Lion Hill, Shenley.

LEYTON Corporation is recommended to invite tenders for 140 W sodium lanterns for lighting Grange Park Road and Church Road.

ROCHESTER Corporation is recommended to seek sanction to borrow the sum of £4,439 for lighting at the Esplanade, Gun Lane, Cuxton Road, Gravesend Road and Maidstone Road.

CHATTERIS (Cambs.) U.D.C. is to apply for permission to borrow £5,400 to cover cost of conversion of remaining gas lighting in main streets and side streets to electricity.

In SILSDEN, near Keighley, Mr. R. Hitchon, chairman of the Highways Committee, recently switched on forty-three mercury vapour discharge lamps which have been erected along just over a mile of the main street to replace the gas lamps installed in 1869. The estimated cost is £3,375.

MACCLESFIELD Corporation has accepted the tender of the North Western Electricity Board, amounting to £5,082, for street lighting on the Hurdsfield and Brookfield Lane sites.

RIPON Corporation has approved plans for improved street lighting in North Road.

Proposals by DAGENHAM Highways and Works Committee for the conversion of street lighting from gas to electricity involve the erection of 320 electric lighting units to replace 182 gas units at an estimated cost of £12,000.

WARRINGTON Corporation is applying to the Ministry of Housing and Local Government for consent to borrow £3,340 for street lighting on sites 5A and 6 of the Orford Neighbourhood Unit.

ILFORD Works Committee is to make application to the Ministry of Transport for authority to carry out relighting schemes in Barley Lane and Goodmayes Lane at the estimated cost of £3,995 and £2,950 respectively.

Twenty-eight gas lamps in Market Place, Bank Street and Dale Street, OSSETT, are to be replaced by forty-five electric lamps on concrete columns.

Under YEOVIL Borough Council's 1953–54 street lighting scheme, 250 W mercury vapour discharge lamps are to be installed in Mugford Road and Dorchester Road (part), 80 W lamps in Penn Hill and 100 W tungsten lamps in Brunswick Street. The total cost is estimated at £2,976.

SCUNTHORPE Town Council is to provide electric street lighting on new Church Farm estate at an estimated cost of £6,660.

Street lighting at HATFIELD, Herts, is to be converted from gas to electricity at a cost of £8,500.

CHELTENHAM Highways Committee is to seek the approval of the Ministry of Transport to the carrying out of a scheme for the provision of street lamps on the Arle and Hesters Way estate at an estimated cost of £3,564.

Christmas Lectures for Boys

THE Institution of Civil Engineers is again arranging a series of three Christmas lectures for boys. These will take place at the Institution at 3 p.m. as follows:—29th December: "Marine Salvage Operations," by Commodore T. McKenzie; 30th December: "Diving in the Royal Navy," by Lieutenant Commander G. H. Lawther, R.N.; 31st December: "The Harnessing of Water in Power Development," by Mr. T. A. L. Paton. These lectures are intended for boys between the ages of 13 and 17 and tickets (free) are available on application to the Secretary of the Institution, Great George Street, Westminster, S.W.1.

Ince Power Station

Views on Semi-Outdoor Construction

OPENING the discussion on Mr. F. H. S. Brown's paper entitled "Some Design Features of the Semi-Outdoor Power Station at Ince" at the Institution of Electrical Engineers on 16th December (see *Electrical Review*, 18th December, p. 1383), Sir Hugh Beaver said that the paper marked a real milestone in the development of power station construction in this country. Having been concerned with a committee which investigated the cost of modern power station construction, he was deeply interested in what he regarded as full-scale experiment. Only five years ago power station design provided for a covered volume of about 50 cu ft per kW installed. The figure for Ince was 24·4 cu ft, and for a projected semi-outdoor power station it had been reduced to 17·5 cu ft.

Estimated Savings

The author envisaged, probably conservatively, a figure of £1 per kW as the probable saving from the method of construction adopted. In the United States, where conditions were almost perfect for outdoor stations, savings of from 8 to 10 dollars per kW were claimed. There were also important economies in labour, material and time. His committee felt convinced, on the evidence it received, that power stations could be built in the United States in not much more than half the average time taken in this country. The B.E.A. and the consultants who worked with them were to be congratulated on the great efforts which they had made in the last five years in the direction of more economic power station construction, and he saw no reason why this country should not be as far advanced as any in the world in this respect.

Mr. P. Percival (Merz & McLellan) suggested that it was only from the point of view of cheapness that there was likely to be any major advantage in outdoor plant in this country, but as units increased in size the outdoor plant would become increasingly attractive from that point of view. In that connection, however, he referred to experience in America with two comparable stations commissioned this year, one owned by the Tennessee Valley Authority and the other by Electric Energy, Inc., both of about 150 MW, designed to serve the Atomic Energy Commission's Kentucky project. One of these was almost completely outdoor, and the other of conventional type. The T.V.A., which owned the conventional station, claimed that the cost was considerably cheaper than the cost of the outdoor station, and it had been commissioned about three months before the outdoor station. That experience had to be taken into account.

Mr. E. Bateson (Rendel, Palmer & Tritton) said that in these days the steel travelled direct from the mills to the fabrication shop and then to the site, with no proper opportunity for weathering or cleaning. He would like to see the exposed steel metal-sprayed, and thought that this would be economic from the maintenance point of view. At Ince there was one boiler house still to be erected, and if it could be arranged for the exposed steel there to be metal-sprayed it would afford a comparison of the two methods of protection.

Boiler Design

Mr. J. Mayer (International Combustion, Ltd.) said that if there had been an error at Ince he thought that it was the mixture of horizontal and vertical partitioning. The boilers were similar to those in at least three other totally-enclosed stations now being built and the enclosure had been adapted to their requirements. He felt it would be better to consider the ideal enclosure and modify the boiler design to suit. A certain amount had to

be done to provide forms of protection, apart from the enclosure, for circulating pipes and so on, and he would estimate this as costing from 2s 6d to 3s 6d per kW. In addition there would be some small increase in maintenance costs and perhaps some small decrease in efficiency, so that in his view a clear saving on capital expenditure of 30s per kW was necessary to make the scheme really attractive.

Mr. F. J. Hutchinson (Kennedy & Donkin) suggested that one of the main advantages of the semi-outdoor type of station was the time saved in its construction. He believed that by using the methods suggested by the author it should be possible to save about ten months in the erection time.

Sir John Hacking (B.E.A.) said that it sometimes seemed to be implied that the outdoor generating station or semi-outdoor boiler house was the established practice in America, but that was certainly not the case, and opinions in the United States on the subject varied very widely. He had been told by the engineer of one company having a large outdoor station that although the saving in cost was very small and the losses from the boilers greater, the conditions for the operating staff were very much improved.

Speed of Construction

There could be no doubt that the Americans constructed power stations much more quickly than we did, and this was a fact to which the B.E.A. had given considerable thought. It seemed to be due to a number of reasons. The Americans were far less hampered by steel and labour shortages than we were; their labour was "mobile-minded" and also more "production-minded." Moreover, the Americans had a much greater number of technologically-trained people to put on any job, because they had more available than could be found in this country. On returning to America after the Korean war, however, following an interval of four years, he found that the Americans were taking nearly 50 per cent longer to erect their generating stations than at the time of his previous visit. Given anything like equal conditions, he thought that this country could do quite as well, although one difficulty from which we suffered was that the time which had to be spent on early planning tended to damp the sense of urgency of everybody connected with the programme.

Mr. K. H. Tuson (Mackness & Shipley) remarked that even if the saving reached the figure of £1 per kW envisaged by the author it would be disappointing by comparison with the figures given by Sir Hugh Beaver's committee. It was of interest to speculate to what extent semi-outdoor and outdoor construction could be applied to atomic power stations. It seemed probable that they would afford scope for outdoor construction.

Mr. W. D. Watson (Mitchell Engineering Co.) said that overseas engineers were carefully watching developments in this country and comparing our designs with those in Germany and the United States. Since we had to export technical skill, we must keep abreast of progress.

Mr. R. A. Peddie suggested that demineralization plants were far superior to evaporators as suppliers of water for the pressure and temperature used at Ince. He was perturbed, from an operational point of view, to hear a reference to the pipework in semi-outdoor stations being "neatly tucked away."

Mr. S. D. Whetman thought it a pity that it had not been possible to provide a completely outdoor boiler house to afford an opportunity of seeing whether that was the answer. He expressed the hope that brick would not be abandoned for the cladding of power stations and pointed out that a judicious admixture of boiler dust with clays not otherwise suitable would provide a very good brick, so that it would be good business on the part of the B.E.A. to encourage the use of bricks.

Break with Tradition

Mr. A. R. Cooper said that the real merit of the Ince project lay not so much in its representing a new type of construction as in its indicating a new type of thinking. The B.E.A. had shown that it was not afraid to make a break with tradition. So far progress in power station design had proceeded at a gentle trot, but here it had made a convulsive jump. It might not have been necessary for the author to visit America to get the idea which led to this station, because there were oil companies very close to Ince using fully-outdoor boiler plant.

The author briefly replied to the points raised.

COMMERCE and INDUSTRY

Generators for America

Further Move in Belfast Plant Contracts

THE contract for the manufacture and installation of two water wheel generators, physically ranking among the largest ever built, has been awarded to the English Electric Export & Trading Co., Ltd., by the United States Army Corps of Engineers at a cost of $3,651,476, which was the lowest bid received (approx. £1,300,000). The maximum output of each generator will be 84,740 kVA at 13·8 kV, 60 c/s, 85·7 r.p.m. (approximately 108,000 h.p. output).

The hydro-electric station at the foot of McNary Dam, built across the Columbia River in the north-west of the United States of America, is designed to accommodate fourteen generating sets, having a total maximum output of 1,186,400 kVA. The two machines under the present contract will complete this station and are due for commissioning before December, 1956. The generators will be built at the Stafford Works of the English Electric Co., Ltd. Each unit will have an overall size of nearly 52ft ; the assembled stator will weigh about 180 tons and the rotor nearly 500 tons.

Upstream from McNary is the Chief Joseph Dam, for which the company is building three 310,000 kVA banks of transformers to step up the generator voltage to 230 kV for transmission.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 12th December is deemed to be 141s 6d. The "cost of material" figures are as follows:—

For electrical machinery and equipment the Board of Trade index figure published on 12th December is 157·0.

For turbo-generating and allied plant: materials used in mechanical engineering industries, 147·3, blast furnaces and iron and steel smelting and rolling (40 and 41), 144·1, price of ¾in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 11th December), 3s 5⅛d per lb.

Outstanding contracts covered by the Board of Trade intermediate products index: the index figure for intermediate products (12th December) is 353·8.

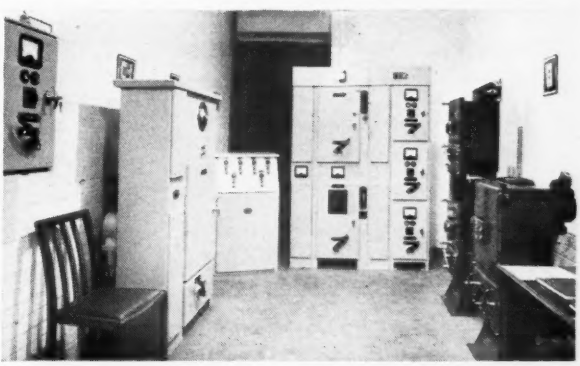
Stewarts and Lloyds' Jubilee

To mark the company's completion of fifty years Stewarts and Lloyds, Ltd., have produced a very handsome 160-page special number of the "S. and L. Review." It is explained in a letter from the chairman, Mr. A. G. Stewart, reproduced as a foreword, that the volume does not purport to be a comprehensive history of the company, but rather an illustrated commentary on the major events within the organization since 1903 with indications of the national and international background against which these have taken place. By means of copious illustration and cogent text this aim is admirably achieved.

Motor Control Gear Showroom

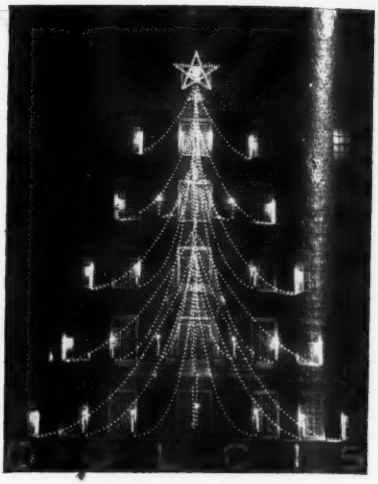
In our issue of 27th November we referred to the opening of a London showroom by the Belmos Co., Ltd., at Columbia House, Aldwych, W.C.2, for the display of its motor control gear of the industrial and flameproof types. The installation of equipment has now been completed, and the general layout of the showroom is shown in the accompanying picture.

The showroom of the Belmos Co., Ltd., at Columbia House, Aldwych



An Electric Christmas Tree

Shops and stores in the West End of London have been looking particularly gay during the past few weeks and Christmas trees with twinkling lights are to be seen everywhere. The accompanying picture shows a Christmas tree formed entirely of electric lamps. This has been erected at the Dolcis shoe store in Oxford Street and is 70ft high. It comprises 2,000 15 W lamps with 150 W lamps representing the candle flames and forming the centre of the star. The installation was carried out by Courtney, Pope (Electrical), Ltd., and was erected in seven days.



The electric Christmas tree at the Dolcis store, Oxford Street, W

Electrical Engineers' Exhibition

We hear from Mr. P. A. Thorogood, general manager of the Electrical Engineers' Exhibition (Earls Court, 16th–20th March next) that 160 manufacturers and associations have now taken space. As before, two silver plaque awards will be made for the most outstanding exhibits of technical and domestic equipment.

Endeavours are being made to attract overseas buyers to the exhibition and to that end the event is being widely publicized abroad.

Electrical Research

Dr. S. Whitehead, the director of the British Electrical and Allied Industries Research Association, contributes the third of a series of articles on British industrial research associations to the December issue of the *F.B.I. Review*. In this Dr. Whitehead deals generally with the work of E.R.A. and gives examples of the variety of subjects with which it deals.

Transformers for Canada

In the accompanying illustration we show a group of three 66/24 kV 3,333 kVA, 60 c/s single-phase transformers forming a three-phase bank, leaving the Denis Ferranti Royton Works for shipment to Canada for the Canadian Government. Owing to the size of these units, the h.v. terminals, radiators and conservators were shipped separately for convenience of transport.

Three transformers leaving the Denis Ferranti Royton Works for shipment to Canada

Thailand Import Regulations

On 16th November import controls were imposed in Thailand by Royal Decree, under which a permit from the Minister of Economic Affairs is required for importing certain commodities.

Goods for which import permits are required include the following:—Ores and metals and metal scrap; glass and glassware; ordinary metals, including iron and steel, copper, nickel, aluminium, lead, zinc, tin, and ordinary metals manufactured and non-manufactured; metal products, including all kinds of tools and equipment, engines and electrical goods; machinery and transport equipment, including machinery used for mining, building and other industries; electric generators, batteries, electric lamps and shades, radio sets, telegraph equipment, telephones, electric wire, all kinds of electrical appliances and all kinds of vehicles; scientific and cinematographic equipment; refrigerators; and plastic goods, etc.

On 20th November the Bank of Thailand stated that the Thai Ministry of Economic

Affairs would now consider import licence applications for new business for the following essential commodities:—Electric generators, including parts and accessories; machinery, engines, tools and implements used in agriculture, manufacture, industry, transport and construction, including parts and accessories; electrical, telegraph and telephone equipment, including parts and accessories; instruments and equipment used particularly for medical and scientific purposes; and lamps, including parts and accessories.

Australian Duties on Vacuum Cleaners

The Australian Minister for Trade & Customs has asked the Tariff Board to report upon the question of import duties on vacuum cleaners and parts. United Kingdom firms wishing to tender evidence must notify the Board by 1st January and they are advised to communicate immediately with the Board of Trade, Commercial Relations & Exports Dept., Horse Guards Avenue, London, S.W.1, quoting reference No. C.R.E. 28965/53.

Coronation Day Broadcasts

How the British Broadcasting Corporation planned and prepared the Coronation Day broadcasts is described in an 80-page book published by the Corporation, Broadcasting House, London, W.1, at 6s. The publication is profusely illustrated and a large section is devoted to pictures taken direct from the television screen.

New Hotpoint Showrooms

New showrooms have recently been opened by the Hotpoint Electric Appliance Co., Ltd., at Crown House, Aldwych, London, W.C.2. The showrooms make use of the contemporary style display and have been set up in order to make available in Central London an adequate display of the wide range of Hotpoint appliances and kitchen equipment.

Fully Impregnated Non-Draining Cables

We have received from W. T. Henley's Telegraph Works Co., Ltd., 51–53, Hatton Garden, London, E.C.1, advance particulars of their fully impregnated non-draining type cables which, although primarily intended for vertical runs and similar situations, are also suitable for normal industrial use. These "F.I.N.D." cables are available for standard voltages up to and including 11 kV and are said to cost no more than standard cables. Details and prices are available from the company.

Labels for Lighting Glassware

In order to concentrate attention on the natural advantages that glass has as a medium for lighting, certain members of the Glass Manufacturers' Federation are introducing, on 1st January, labels for lighting glass leaving their works, indicating that the glass is a product of a member of the Federation. Leaflets will be circulated to architects and surveyors in private and public practice pointing out that glass gives the best light transmission, and stressing the fact that British made glassware is subject to strict quality control.

Belfast Contracts

At a meeting of the Belfast Corporation on 14th December it was decided to seek tenders for a third time for plant for the new power station. On the recommendation of Mr. E. Warnock, Q.C., the Attorney-General of Northern Ireland, the present tenders are being returned unopened. Ald. C. McKee said that in the specifications the Corporation stipulated

Two views of the new showrooms opened by the Hotpoint Electric Appliance Co., Ltd., at Crown House, Aldwych, W.C.2

that the mechanical stokers must be manufactured by Babcock & Wilcox, but three firms had been informed by Babcock & Wilcox that they were not prepared to quote for the supply of stokers. The Corporation decided that applicants for new tender forms may offer an alternative make approved by the Council after consultation.

Proximity-Fuse Claim

Last week the Royal Commission on Awards to Inventors heard the claim of Mr. H. Cobden Turner, managing director of Salford Electrical Instruments, Ltd., and three others employed at the relevant time by the company—Messrs. G. Tomlin, W. H. B. Lord and L. Rollin—for an award in respect of the invention of the radio proximity fuse. On the claimants' behalf it was contended that this was the most important invention of the war. It had defeated the "V1" menace and had been extensively used by the artillery and R.A.F. Evidence in support of the claim was given by Gen. Sir Frederick Pile, who was responsible for anti-aircraft defence during the war.

Calendars

The calendar of the Ateliers de Constructions Electriques de Charleroi, Belgium, takes one, pictorially, on an historic tour of Belgium, each monthly sheet bearing a picture portraying an event in the country's history.

For their 1954 calendar C. A. Parsons & Co., Ltd., have again chosen a set of attractively coloured views of British beauty spots—one for each month of the year.

Vehicle Lamp Dispenser

A new "Mazda" lamp dispenser primarily for use in garages has shelf space for over eighty "Mazda" lamps of the types used in cars, motor cycles and commercial vehicles. There is a detailed price list to one side of the dispenser and a hook is provided on which to hang a copy of the new 60-page "Mazda" dealers' guide. The unit may be stood on a counter or hung on a wall.

Commercial Travellers' Benevolent Institution

The annual Court of Governors of the Commercial Travellers' Benevolent Institution will be held at the Berners Hotel, Berners Street, London, W.1, on 28th December next. The Board will recommend an alteration to the rules increasing the present maximum rates of the annuity from £65 to £104 in the case of a member, and from £40 to £78 for a widow.

Switch Packaging

The "Dimma" 3-light switch made by Electrothermal Engineering, Ltd., is now supplied in a new twelve-unit pack, attractively designed and printed in pink and black. It also serves as a sale display, easily erected into a sturdy dispenser for counter sales.

Electrical Scrapbook

The International General Electric Co. of New York, Ltd., which has completed seventy-five years, has issued a booklet illustrating the progress made by the American electrical industry during this period.

Tungsten Ore Prices

The Ministry of Materials has announced that as from 18th December its selling price for tungsten ores of standard 65 per cent grade and ordinary quality has been reduced as follows:—Wolframite, from 195s to 185s; Scheelite, from 180s to 170s per long ton unit delivered consumers' works.

Trade Announcements

Ekco-Ensign Electric, Ltd., announces the following changes in area representation:—Mr. R. K. Taylor now covers the E.C. London postal districts, Mr. R. W. Palmer covers the S.E. London postal districts, and Mr. J. H. Munns certain parts of East Somerset, Wiltshire and Gloucestershire.

The **Victoria Electric Plant Co., Ltd.,** has removed to 19c, Westminster Palace Gardens, Victoria Street, London, S.W.1.

Dimplex, Ltd., Totton, Southampton, has appointed Mr. R. C. Flook as sales manager for Southern England. Mr. Flook was previously the assistant buyer in the Electrical Department of Harrods, Knightsbridge. He will operate from his home address at 100, Garthorne Road, Forest Hill, London, S.E.23.

The Middlesbrough office of the **British Thomson-Houston Co., Ltd.,** is now at Prudential Chambers, 27, Albert Road, Middlesbrough. The telephone number is unchanged.

Catalogues and Lists

Allen West & Co., Ltd., Brighton, 7.—Illustrated brochure on electric motor control gear and switchgear for all industrial, marine and traction applications (1754).

Thorn Electrical Industries, Ltd., 105-109, Judd Street, London, W.C.1.—Leaflet illustrating the new Tricity "Queen" cooker (TL/120) and a leaflet dealing with "Atlas" fluorescent tubes (AL/115).

Thermolectrics, Ltd., Chapel Works, Church Street, Hampton-on-Thames, Middlesex.—Illustrated priced folder of "Siesta" blankets and pads.

Visco Engineering Co., Ltd., Stafford Road, Croydon, Surrey.—Illustrated booklet dealing with modern dust collection and fume removal (532).

SOUTH AFRICAN NEWS

From Our Cape Town Correspondent

CAPE TOWN'S city electrical engineer has asked the City Council to authorize the expenditure of £400,000 on a tenth boiler for Table Bay power station. He said the nine boilers were no longer adequate. The calorific value of the coal had deteriorated seriously and was likely to become worse; it was less than what the boilers were designed for. Two of the original alternators had been replaced by larger machines. The City Council would be forced back on the Table Bay power station as its main source of supply when the pooling agreement ended in May, 1957. Without the additional boiler the station could not maintain its capacity of 160,000 kW but might drop to 150,000 kW. This would mean buying the extra 10,000 kW from the Electricity Supply Commission and might make load shedding necessary. With two boilers out of commission for overhaul and Government inspection, and one for cleaning and repairs, six boilers could produce only 140,000 kW.

Power Requirements Increasing

When "Escom" brings its eight new power stations into operation and has completed the extensions to existing plants, the total installed capacity of its undertakings will be 2,964,580 kW, compared with 1,698,580 kW at the end of last year. When this major development was first planned, to be completed by 1956, it was thought that it would more than meet the Union's needs. But now the indications are that by then power supplies will again be lagging behind the demand.

An analysis of the future developments expected in the various sections of the South African economy suggests that, as a whole, power requirements will rise steadily for many years to come. In the mining industry, after the consumption curve had been rising for some years past, it has levelled out to some extent. But even assuming that the rate of increase is maintained at this lower level, Escom estimates that when all the new plant under plan and in construction is operating, by the middle of 1956, it may be difficult to cope with the demand on the Rand.

The position in the gold mining industry has undergone two radical alterations since the first plans for increasing power supplies were put into operation. First, the recovery of uranium will call for increasing amounts. Secondly, the high capital cost of bringing new gold mines to the production stage has made it essential that milling rates be increased as rapidly as possible, so that loans can be repaid at the earliest possible date. In the early stages of the development of the new goldfields it was estimated that gold production from them would reach its peak around 1960. The acceleration of plans for expansion is likely to bring this time nearer, and with it increased power demands.

A further factor is the drive towards a greater degree of mechanization of mines, arising out of the shortage of native labour.

A new generating station which is under construction near Durban will have an initial capacity of 60 MW, to be expanded later to 240 MW. Other new stations are to be sited at Cape Town (Salt River No. 2), Port Elizabeth and East London. Three new stations will augment the supplies of power available for gold mines, uranium production and industry in the Orange Free State and the Southern Transvaal. Each station is sited on a coalfield, thus ensuring economy in the cost of fuel. The Commission's chairman stated that turbo-generators with a total capacity of 300 MW have been ordered for the Vierfontein station. The main installation at the Taaibos station will be seven 60 MW turbo-generators, and the first set should be ready during the second half of 1954. The third station, the Wilge, is planned for a capacity of 180 MW, and one 30 MW turbo-generator was due to be completed by September last.

Tenders from Germany

Requiring two 30,000 kVA transformers, the Cape Town Electricity Department, for the first time in many years, recently invited world-wide tenders. Great Britain, the United States, Germany, Italy, Austria and Belgium sent in 27 offers and the lowest delivered price was £43,920 for two transformers made by the A.E.G., Western Germany. The highest tender was £103,282 for transformers made in the United States by the General Electric Company. England was ninth on the list with a quotation of £60,480 from the Brush Electrical Engineering Co., Ltd. Eight manufacturers (four in Germany, three in Italy and one in Austria) all made lower offers. Acceptance of any tender has been postponed and further information has been called for.

The City Council's consulting engineers remarked: "Continental transformers are in general somewhat inferior in design and construction to those put forward by British manufacturers, but we have no reason to believe

that the A.E.G. transformers will be unsatisfactory in service, and in view of the low price you may be prepared to accept a higher risk than with the British transformers." Reference was also made to a feature of Continental transformers "which may lead to trouble with excessive noise emission." The city electrical engineer recommended acceptance of the lowest British tender.

The two transformers are required for installation in a main substation. They will be connected to new 66 kV cables to be laid at a cost of £250,000 as part of the major developments to the transmission system to be undertaken in 1953–57. The transformers will form a link between these transmission cables and the 12 kV distribution system which supplies consumers in the southern suburbs.

Illumination Engineering

A South African National Committee on Illumination has been formed following a meeting in Pretoria of representatives of leading firms and organizations interested in lighting, of Government Departments, and of the Council for Scientific and Industrial Research and the Bureau of Standards. It is proposed that this committee should represent South Africa on the International Commission on Illumination and sponsor research where it is in the national interest. It will endeavour to promote good illumination engineering practice in the Union and encourage the study of all subjects relating to the science and art of illumination.

Investigations into Lightning

The investigation of lightning strokes by means of radar is part of the work now being undertaken by the Telecommunications Research Laboratory of the South African Council for Scientific and Industrial Research. In the seventh annual report of the Council it is stated that because radar echoes can be received from the actual column of lightning, a new way of investigating the mechanism of lightning has been opened up.

Railway Electrification

Work is to go ahead on converting the suburban railway line from Cape Town to Simonstown from 1,500 V to 3,000 V. The estimates provide for replacement of 1,500 V substations at Milnerton, False Bay, Diep River and Glencairn and 3,000 V stations are to be built at Salt River and False Bay. Provision is also made for work to start on a new electrified line from Maitland to Observatory.

Copper Refining

In a survey by the Department of Commerce and Industries on the possibilities for the establishment of an electrolytic copper refinery in the Union it is pointed out that the present local demand for electrolytic copper is still somewhat less than 20,000 tons a year. It may be accepted, however, that with the develop ment of more new industries and also the ne Orange Free State goldfields, as well as t concomitant expansion of copper power sup lines, the ever-increasing demand for cop will be maintained, and that by 1957 it n possibly exceed 30,000 tons a year. Vereenig and the Rand are the principal copper-c suming centres in the Union. In view of cheap electric power and coal availa Vereeniging should prove a favourable loca for a refinery.

Atomic Research

Last year work was begun on a power sta near Witbank, Transvaal, costing £10 mi to provide the extra power needed for ura extraction. New plants for the producti sulphuric acid, necessary for the process going up. Meanwhile South Africa's atomic research plant, to cost £245,000, is built near Pretoria, and is likely to operation next year. It will contain a equipped nuclear physics laboratory 45in cyclotron.

Kafue Scheme

Mr. R. A. Nicholson, Economic Secretary Northern Rhodesia and chairman of the Kafu River hydro-electric authority, was in Johannesburg in the middle of September for talks on the £30 million Kafue scheme to supply power to Northern and Southern Rhodesia. In implementing this scheme a force of some 360 Europeans and 6,000 natives will be needed, and this may be one of the major practical difficulties. Others are finance and the transportation of materials to the site. Finding the money for the scheme is naturally the first step in the Government's programme, but it is understood that several large concerns have already expressed interest in the possibilities of investment.

Luderitz Power Station

The new power station at Luderitz is nearing completion and will be in operation early next year. The plant will not only supply the town with power but will also condense sea water to supply fresh water to the residents. Water and electricity have always been the great problem at Luderitz, which has just celebrated its 75th anniversary.

Modernization of Pumping Stations

The Metropolitan Water Board Works and Stores Committee proposes to remodel the Rammey Marsh and Waltham Abbey pumping stations at an estimated cost of £117,900, made up as follows:—Adaptation of buildings and demolition work, £22,700; main-laying, £3,150; and purchase and installation of machinery, £92,050.

ELECTRICITY SUPPLY

Generation in November

Easy Payment of Accounts

WITH abnormally mild weather prevailing in November the rate of increase in electricity output fell markedly below the average for the year. Figures published by the Ministry of Fuel and Power show that altogether 6,099 million kWh was generated, an increase of 2·6 per cent over November, 1952; for the year to date the average improvement is now 6·3 per cent. At the end of November the aggregate installed capacity was 18,657 MW against 18,594 MW a month before. New plant installed in B.E.A. stations included the following:—Carrington: 360,000 lb/hr Babcock & Wilcox boiler. Littlebrook "C": 360,000 lb/hr International Combustion boiler. Carmarthen Bay: 240,000 lb/hr B. & W. boiler. Rye House: 350,000 lb/hr B. & W. boiler. Chadderton: 360,000 lb/hr Simon-Carves boiler. Connah's Quay: 300,000 lb/hr boiler. North Tees "C": C. A. Parsons 60 MW set.

Electricity Stamps

The North Western Electricity Consultative Council, which first suggested that special 2s 6d stamps should be introduced to make it easier for domestic consumers to meet their quarterly power bills, is making recommendations to the Board for expanding the sale of the stamps. The stamp scheme, introduced by the North Western Board about twelve months ago, has rapidly gained popularity and sales are now understood to be in excess of £100,000 a year. At present the stamps are sold at Board showrooms throughout the area but among ideas discussed by the Consultative Council are making the stamps available through selected electrical contractors and also instructing meter readers to mention the scheme to domestic consumers on their visits.

Smokeless Zones in Bradford

Bradford Health Committee is recommending that an Order should be made under the 1949 Bradford Corporation Act prohibiting the emission of smoke from any premises in twenty zones in the city, one in the central area and the remainder covering estates on the outskirts.

Electric Heating and "Smog"

The North Western Electricity Consultative Council is making representations to the Chancellor of the Exchequer calling for concessions in purchase tax on electric radiators "because of the contribution they make to reducing the menace of atmospheric pollution."

Council House Installations

Esher Urban District Council has approved a scheme for the installation of electric lighting and power points in about 50 Council houses.

It was reported to the Sittingbourne and Milton Urban District Committee that the cost of supplying electric lighting and heating to pre-war council houses would be about £13,833. Tenants are to be asked for their views on the provision of these amenities before a decision is reached.

ELECTRICITY GENERATED AND PLANT INSTALLED

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total*		
British Electricity Authority ..	3,236	80	9·6	5,879	70	5,958	5,603	18,090
North of Scotland H.E.B. ..	13	1	1·1	21	116	141	140	567
Total for November, 1953 ..	3,249	81	10·7	5,900	186	6,099	5,743	18,657
Corresponding total for November, 1952	3,280	85	6·4	5,788	145	5,947	5,611	17,167
Increase or decrease, per cent ..	−1·0	−4·7	+67·2	+1·9	+28·3	+2·6	+2·4	+8·7
Total to date (11 months), 1953	32,060	820	84·0	57,730	1,104	58,979	55,479	
Total for corresponding months of 1952	30,825	757	61·0	54,179	1,144	55,463	52,241	
Increase or decrease, per cent ..	+4·0	+8·3	+37·7	+6·6	−3·5	+6·3	+6·2	

* The total includes 8·9 million kWh generated by oil engines and 4·5 million kWh by waste heat plants in November, 1953.

Employers' Liability

National Insurance and Common Law

By F. E. SUGDEN

SINCE the introduction of the National Insurance Act certain confusion appears to have arisen as to the limitation, if any, of the liability of employers. Perhaps I have mentioned it before, but I would like to repeat it for record purposes, namely, that if certain injuries arise in the course of employment the employee must claim under the National Insurance Act. In the past, if an accident occurred the employee claimed under the Workmen's Compensation Act, which does not now exist, on the grounds that " the accident was arising out of and in the course of his employment." On the other hand if it is purely the employer's negligence which caused the accident and not that of the employee, then the employee can bring a common law action against the employer for damages, irrespective of the National Insurance Act.

What happens when the liability seems to rest on both parties? I can best answer that question by quoting a case which recently came before the Court of Appeal. Briefly the facts were these. An electric cable conveyed current to a travelling crane at the defendants' works to energize a magnet. While an electrician employed by the defendants was pulling at the cable in order to free it after it had jammed, a defective joint in it broke and the electrician fell and was killed.

The Court held that the cable was not one of the " parts and working gear of a lifting machine " in accordance with the Factories Act but was a mere electrical lead, and the defendants were, therefore, not in breach of a duty to ensure that it was of good construction in accordance with the Act. Therefore in this part of the question, the employers were not liable.

But there are various regulations made by the Government to supplement the statutes which are as equally operative as the statutes. Continuing the case: the Court further held that the provision in the Regulations for the Generation, Transformation, Distribution and Use of Electrical Energy in premises under the Factory and Workshop Acts (Regulation 6) that an electrical joint should be of proper construction as regarded mechanical strength, meant strength necessary to resist such a pull as the electrician would be likely to exert to free the cable if the need arose, as distinct from the strength necessary safely to carry electric current. As a consequence the defendants were liable in this connection for breach of the regulation.

In view of this decision it is incumbent upon factory owners or electrical contractors to exercise greater diligence than in the past in order to ensure that all equipment is very searchingly examined.

Naturally the question will be asked: What precautions can be instituted to prevent any liability arising from broken cables and defective gear? There is no specific answer and every case is judged strictly on the circumstances before the Court. There is no text-book or treatise which lays down specifically what are adequate precautions to prevent accidents. The Court will have to be satisfied that the employer has done everything possible to avoid accidents and in coming to a conclusion will take a common-sense view of the matter and ask itself the question: Could the employer have done anything else physically possible in order to guard against accidents?

If, for instance, the work of inspection had been delegated either to an incompetent official or a minor official who was not accustomed to inspection, then the employer would be liable for negligence if an accident arose.

As I have explained, there are two liabilities, liability that could not have been avoided which arose out of and in the course of employment and is covered by the National Insurance Act, and liability which could definitely have been avoided, known as common law liability. In the latter case, where negligence is proved, damages might run into thousands of pounds.

Load Forecasting

Ontario Commission's Weather Studies

By William Prentice (Toronto)

ENGINEERS of the Hydro-Electric Power Commission of Ontario are studying the daily influence of weather conditions on power demands and other phases of " Hydro's " widespread and complex operation. The studies are based on the measurement of the daily changes of light intensity, wind velocity and temperature.

With the Commission's facilities for studying weather, combined with the weather predictions made by the Meteorological Division of the Department of Transport, engineers claim to be able to forecast the Province's daily power demands to within 2 per cent. With the power situation in Ontario such that every precaution must be taken to ensure that electricity can be saved whenever possible, this is making a firm contribution to the stability of the service.

Studies have shown that varying weather conditions can make the demand fluctuate by as much as 5 per cent—or almost the total output of the large Chenaux generating station on the Ottawa River.

Although power demands generally are mounting every day over corresponding periods of a year ago, the major effect of changing weather conditions is with respect to times of peak demand. These peaks of high demand are acutely affected by dull, cloudy days. The passage of a heavy thunderstorm, for example, can reduce the illumination in an area to 5 per cent of that of a clear day.

To calculate this effect of light intensity on demands, the Commission has put to use an " illuminometer." For the past two years this device, at the top of the Toronto head office, has been measuring the daily changes in light intensity. A similar instrument is also employed at the Department of Transport offices on the outskirts of Toronto.

By correlating information revealed by the illuminometer and data supplied by the Department of Transport Weather Bureau on daily wind velocity and temperature changes, Hydro engineers are now able to anticipate day-to-day loads in the Southern Ontario system with greater accuracy than ever before.

Forecasting power requirements has many other benefits. In the costly business of steam generation, it gives engineers notice of the need to have ready additional units at the Commission's two large steam stations at Toronto and Windsor. Weather forecasting is proving invaluable in other fields of operation. Knowing the weather in advance gives the Commission an opportunity to carry out maintenance work on units in its generating stations, a task which is becoming increasingly difficult as power demands rise and nearly all generating facilities are required over an extended period.

Heavy-Oil Engine Working Costs

IN the report of the Diesel Engine Users' Association on the working costs of heavy-oil engines in 1951–52, figures are given for 64 generating stations at home and overseas, 18 waterworks and two marine installations. Information is presented mainly in six comprehensive tables divided into two sections, i.e. installations containing mechanical injection engines only and those in which air-blast types are also included.

Returns from 29 home stations show that these contained 122 engines of 47,718 kW capacity in all, which generated 40·8 million kWh, meeting a maximum demand of 32,619 kW with an average station load factor of 14·3 per cent and a running plant load factor of 66·4 per cent. The average price of fuel oil (10,706 tons), including tax and delivery, was £15 3s per ton and, at 0·587 lb per kWh generated, 0·956d. Lubricating oil (36,922 gall) at 4s 8½d/gal cost 0·051d per kWh, stores and water 0·03d, operating wages 0·312d, repairs and maintenance 0·263d, the total engine cost per kWh generated amounting to 1·612d. For 35 overseas stations the overall cost worked out at 1·799d/kWh and for 18 home waterworks 2·167d/water h.p.-hr.

Financial Section

STOCKS and SHARES

CHRISTMAS having escaped from the dire threat of a railway strike, Stock Exchange markets experienced sensible relief from the calamity which came so uncomfortably close. As soon as settlement of the threatened strike was known, prices went ahead pretty sharply from the lowered levels to which they had been reduced partly by apprehension, partly by a generally negative attitude on the part of possible buyers. Electricity stocks in the consol market rallied, and in the industrial groups shares such as Crabtree, English Electric, General Electric and various others, showed a prompt recovery. This, however, was not backed up by any noticeable accession of business, and, consequently, a mild reaction followed from the best prices touched at the end of last week. But the House breaks up for Christmas with a quiet mind, and although business might be considerably better than it is, some of the markets display a reasonable degree of activity considering the time of year.

Earnings and Dividends

Industrial wage problems accentuated this year the usual tendency for Stock Exchange business to contract with the approach of Christmas-time. In the circumstances, markets were glad of the stiffening introduced by two or three more company results of the kind produced earlier in the month by Joseph Lucas and Turner & Newall. Courtaulds are among the latest of the great industrial firms to announce improved earnings figures, a capital bonus proposal and some relaxation in the austerely conservative dividend policy of recent years. Regarded as a token of what may be expected when the main season of company reports opens in a few months' time, these events are acting at present as a main support for the industrial market.

S. Smith Bonus

There was a ready initial response in S. Smith & Sons (England) 4s shares to the proposal of a capital bonus. Already a good market at around 11s on the strength of the increased earnings and dividend announced earlier, they were marked up further to 12s 6d immediately after this news. The intention is to issue three new shares for every five at present held. Explaining the operation at the annual meeting last week, the chairman showed that as a result of the scale on which profits have been ploughed back into the business over many years, capital employed now greatly exceeds the nominal amount in issue. This operation will go some way towards removing the disparity.

English Electric New Shares

Issued as a one-for-two capital bonus, English Electric new £1 shares are currently available free of the 2 per cent transfer stamp duty on a purchase, and will remain so until the first week in January. The price was lifted, temporarily, to 38s 6d after the recent news of the company's successful tender for a substantial American contract. English Electric ends its financial year this month. Shareholders have been warned that the share bonus does not necessarily imply any change in dividend policy, but the annual results—which generally appear as early as February—are awaited this time with particular interest.

Contactor Switchgear

Dealings were due to begin this week in the 5s ordinary shares of Contactor Switchgear, Ltd., the electrical control gear manufacturers. The £150,000 capital of the company is all in ordinary shares. Particulars advertised in connection with the marketing give a progressive ten-year record of earnings. The directors expect to be in a position to recommend, for the period ending next July, dividends totalling 22½ per cent. On the basis that the earnings for this year will be not less than the average for the last four years, such a payment would be comfortably covered. Opening price for the shares was expected to be around 11s 9d, which would make the prospective yield 9½ per cent.

E.M.I.

The 10s shares of Electric & Musical Industries have remained dull at around 12s, which is the lowest price recorded since the war. This position reflects the recent cut in the dividend from 12 to 8 per cent, and the unprofitable outcome of group operations during the year ended last June. After dealing at the meeting a fortnight ago with the causes of the recession the chairman thought that prospects for the immediate future were brighter in some respects; but, with uncertainty still existing in others, he was cautious about forecasting the financial results of the current year.

REPORTS and DIVIDENDS

S. Smith & Sons (England), Ltd.—The annual meeting was held on 15th December, when Mr. R. Gordon-Smith (chairman and managing director), who presided, said that the improvement in profit for the year resulted in the main from increased sales in all major sections of the business. After referring to the various divisions, Mr. Gordon-Smith mentioned the progress of Kelvin & Hughes, Ltd., whose output, he said, showed a substantial increase over the previous year's record, making a total increase of 70 per cent during the last two years. With regard to the current year the total sales to date, as compared with the previous year, showed a satisfactory increase. Various plans for expenditure in respect of new products, and also for modernization of the older factories, would probably involve capital expenditure and working capital over the next year or two of some £750,000.

The company has applied for Treasury consent to the capitalization of £1,084,117 of reserves by paying up in full 5,420,585 new 4s ordinary shares. It is proposed to issue the shares to ordinary shareholders in the proportion of three new shares for every five held.

Aerialite, Ltd.—The annual meeting was held on 16th December, when Mr. L. S. Hargreaves (chairman and managing director), who presided, said that turnover during the year under review increased by 14 per cent as compared with the previous year. Some of the new products mentioned last year had now been put on the market, resulting in increased business. For the first six months of the current year they had achieved a very considerable increase in turnover. The extension of the factory was now in operation and had enabled them to expand their television aerial production. Their subsidiary, Nettle Accessories, Ltd., had had a good year. The order book generally was healthy.

The English Electric Co., Ltd., has announced that £130,300 (nominal) 4½ per cent debenture stock, 1972-77, was drawn on 8th December for redemption. The redemption will be effected at par on 1st February next, and will leave £5,302,382 of this stock outstanding.

Associated British Engineering, Ltd., has announced an interim dividend on the ordinary stock of 3 per cent.

Worthington - Simpson, Ltd., has declared an interim dividend of 10 per cent (unchanged) on increased capital.

New Companies

B.B.S. (Radio), Ltd.—Registered 2nd November. Capital £10,000. To acquire the business of Harold Sturgess and Wallace Baker hitherto carried on at 30, Wellington Street, Kettering, as B.B.S. Public Address Equipment. Directors: H. Sturgess and W. Baker. Regd. office: 30, Wellington Street, Kettering.

View Rentals (City), Ltd.—Registered 14th November. Capital £10,000. Electrical and mechanical engineers, manufacturers, repairers and hirers of and wholesale and/or retail dealers in television and radio apparatus, etc. Directors: Peggy Hollamby and J. P. Hollamby. Solicitors: Kimbers, Williams & Co., 34, Nicholas Lane, E.C.4.

Walter Crane (Electrical Engineers), Ltd.—Registered 17th November. Capital £2,000. Directors: W. Crane and C. E. Collett. Regd. office: 91/5, Westgate, Wakefield.

W. H. Baron (Sheerness), Ltd.—Registered 25th November. Capital £2,000. Electrical and general engineers and radio and television dealers, etc. Directors: W. H. Baron (permanent), W. Baron and Mrs. Lucille Watson. Secretary: H. C. Richards. Registered office: 5, The Broadway, Sheerness, Kent.

H. Strong & Son, Ltd.—Registered 21st November. Capital £1,000. General electrical manufacturers and electrical engineers and contractors, radio and television engineers, etc. Directors: H. Strong, Florrie Strong, L. Strong and Margaret A. Strong. Solicitors: Allen & Son, 17, Carlisle Street, W.1.

A. Felix Industries, Ltd.—Registered 28th November. Capital £5,000. Oil fuel engineers, electrical engineers, manufacturers of and dealers in electronics and radar equipment, mechanical, constructional and consulting engineers, etc. Directors: A. Felix, W. H. V. Clark, R. M. Ball and B. J. Farrow. Solicitors: Gouldens, 16, Byward Street, E.C.3.

Bankruptcies

B. T. Smith, The Studio, Ramsgate, Louth, Lincs, electrical engineer and contractor.—Receiving order made 7th December on debtor's own petition.

W. Heywood, 13, Miller Road, Oldham, Lancs, electrical engineer.—Public examination 28th January at the Court House, Church Lane, Oldham.

H. C. Francis (deceased), lately carrying on business at 5a, Brighton Road, Redhill, Surrey, electrical engineer.—First and final dividend of 12s 7d in the £, payable on and after 12th January at Latham & Co., Walter House, 418-422, Strand, London, W.C.2.

Costs and Tariffs in New Zealand

Hydro-Electric Department's Report

IN presenting his annual statement as Minister in Charge of the New Zealand Hydro-Electric Department, Mr. W. S. Goosman describes 1952–53 as a relatively good year and one of triumph over great difficulties. This appraisal may seem strange in view of the loss of over a million pounds which the Department incurred on a total revenue of £4·7 million; its justification, however, lies in the fact that the power shortage which has greatly handicapped the country was at length relieved with the coming into operation of the Maraetai development. The station started at partial head in October last year and is expected to reach its full designed capacity of 108,000 kW by next summer. This addition to the State's hydro-electric resources should also be of benefit financially, for the higher cost of fuel for the thermal stations has been responsible for the present deficit.

Bulk supply charges in New Zealand are fixed for a five-year period and an important event last year was the negotiation of the contract for 1953–58. Referring to this, the general manager of the State Department (Mr. A. E. Davenport, B.E., M.I.E.E.) says that the time is approaching when the type of contract with the supply authorities will have to be reviewed. Provision is made for a new price to be negotiated after two years or a rise and fall clause is incorporated. The basis of the present contract is maximum demand, which the general manager considers preferable to the two-part form (m.d. and kWh supplied). The tariff is uniform for all supply authorities. (Until this year a number of individual supply authorities had contracts varying from the standard one.) It ranges from £12 to £10 10s per kW per annum with steps at 200, 20,000 and 50,000 kW. For the 1948–53 contract the charges ranged from £10 to £6 per kVA with steps at 200, 10,000, 25,000 and 70,000 kVA.

Retail Tariffs

Retail charges in New Zealand range from ¼d to 10d per kWh under a variety of tariffs. In addition, for several applications, e.g., public lighting, pumping and water heating, there are unmetered flat rates. The Marlborough Electric Power Board offers a 10 hr a day supply for water heating at £6 per kW of capacity a year; Poverty Bay E.P.B. 1s 9d a month per 100 W capacity (domestic water heaters); and South Canterbury E.P.B. an 8 hr night supply rate of £5 per kW a year. A number of authorities have night rate tariffs for bakers, such as that of the Bay of Plenty E.P.B. (8s 4d per kW of ½ hr demand a month and ¼d/kWh). In calculating charges it is the practice of some Boards to do so in blocks of 10 kWh, e.g., 6d where the rate is 0·6d/kWh. Details of the tariffs are set out in a 156-page "Schedule of Electricity Charges in New Zealand" published by the Electrical Supply Authorities' Association of New Zealand, Bethune's Building, 154, Featherston Street, Wellington.

Earphone Calibration

THE basic features of an artificial ear for use in the objective calibration of earphones of the external type over the approximate frequency range 50–10,000 c/s are described in B.S. 2042 : 1953. The primary function of the device is to provide means for comparing objectively the response characteristics of an earphone under test with those of a reference earphone of the same pattern, the performance of which has been evaluated by appropriate measurements or subjective tests. For example, in the case of audiometer earphones of a given pattern, the reference earphone of this pattern is envisaged as having been calibrated subjectively in terms of the threshold of hearing of normal subjects.

The standard seeks to ensure that objective comparisons between earphones of similar pattern carried out on the artificial ear shall reproduce the comparisons which would obtain on human ears with the same earphones. It should, however, be noted that the device as specified cannot necessarily be relied upon to provide equally valid comparisons between earphones of dissimilar pattern, unless the measurements are supported by evidence as to the comparative performance of the earphones on human ears.

Two different positions are specified for the probe-tube of the microphone and the position chosen for any particular measurement has to be quoted when stating results. This standard is not applicable to artificial ears for use in the calibration of insert-type earphones. It is intended that such artificial ears shall be the subject of a further standard. Copies of the standard may be obtained from the British Standards Institution, Sales Branch, British Standards House, 2, Park Street, London, W.1, price 2s 6d.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 3rd February from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1947

6050. Compagnie Générale de Télégraphie sans Fil.—Current rectifier tubes. 3rd March, 1947. (703321.)

33114. Research Corporation.—Electronic tubes. 16th December, 1947. (703471.)

1948

3343. Marconi's Wireless Telegraph Co., Ltd.—Cathode-ray tubes. 5th February, 1948. (703323.)

6238. Board of Trustees of Leland Stanford Junior University.—Methods of and apparatus for generating, amplifying or converting ultra-high-frequency electrical oscillations. 28th February, 1948. (703324.) 6243. Methods of and apparatus for generating, amplifying or converting ultra-high-frequency a.c. energy. 28th February, 1948. (703325.)

1949

114. Hemingway, A. V.—Automatic control systems such as servo systems. 3rd January, 1950. (703329.)

4175. Electric & Musical Industries, Ltd.—Circuits for providing a constant voltage. 16th February, 1950. (703332.)

28476. Pruden, D. C., and Towle, H. G.—Electric bus-bar systems and means for making connections thereto. 7th November, 1950. (703343.)

28713. Telephone Manufacturing Co., Ltd.—Electrical communication systems comprising a loudspeaker and a microphone. 9th November, 1950. (703346.)

32964. Tele-Vox (London), Ltd., and Halford, W. C. J. —Telephone amplifiers. 27th December, 1950. (703352.)

1950

2662. British Dielectric Research, Ltd.—Fibrous insulating material. 31st January, 1951. (703394.)

3536. Crowne, A. A. J.—Frequency conversion adaptors, convertors and the like. 4th May, 1951. (703395.)

10447. Electric & Musical Industries, Ltd.—Conveyors. 13th April, 1951. (703246.)

12261. Ferranti, Ltd.—Prepayment attachments for commodity-measuring meters. 16th May, 1951. (703356.)

12451. Standard Telephones & Cables, Ltd.—Electric pulse communication systems. 18th May, 1950. (703247.)

12542. Electric & Musical Industries, Ltd.—Mechanisms for imparting intermittent movement. 8th May, 1951. Cognate application 14524, 10th June, 1950. (703543.)

18953. Tate, A. E.—Connectors for electric cables. 30th July, 1951. (703545.)

19049. Standard Telephones & Cables, Ltd.—Electric frequency modulators. 31st July, 1950. (703254.)

19444. General Electric Co., Ltd., and Cates, J.—Electric circuit arrangements for operating low pressure electric discharge lamps having preheatable electrodes. 16th July, 1951. (703255.)

21241 & 22104. General Electric Co., Ltd., and Phillips, L. E. A.—Electric lighting fittings. 28th August, 1951. (703258 & 703260.)

25537/40. Metropolitan-Vickers Electrical Co., Ltd.—Electrical power transmission systems. 18th October, 1951. (703263/6.) 25541. Gas turbines. 19th October, 1951. (703267.) 25542. Electric vibrating regulator devices. 18th October, 1951. (703268.)

28227. National Research Development Corporation.—Means for launching beams of ultrasonic radiation in a medium. 16th November, 1951. (703480.)

28369. Franco-British Electrical Co., Ltd., and Brackensey, A. H.—Illumination of traffic signs. 20th November, 1951. (703481.)

30698. Oldham & Son, Ltd., and Booth, F.—Electric batteries. 19th October, 1951. (703482.)

1951

2041. Research Corporation.—Method of constructing electronic tubes. 16th December, 1947. Divided out of 703471. (703485.)

4300. Westinghouse Electric International Co.—Magnetic core structures. 22nd February, 1951. (703365.)

5235. Chloride Electrical Storage Co., Ltd.—Battery charging arrangements. 14th February, 1952. (703424.)

5412. Sykes, A. F.—Electrical sound recording apparatus. 8th April, 1952. Addition to 650769. (703275.)

9816. Soc. d'Etudes et de Participations Eau, Gaz, Electricité Energie Soc. Anon.—Regulation of power plants, including a free-piston auto-generator and receiver machine such as a turbine. 26th April, 1951. (703284.)

10197. Philips Electrical Industries, Ltd.—Lighting systems. 1st May, 1951. (703369.)

11687. Metropolitan-Vickers Electrical Co., Ltd.—Dynamo-electric machines. 28th March, 1952. (703370.)

11943. General Electric Co., Ltd., and Domville, A. R.—Electrical devices of the kind having a substantially logarithmic characteristic. 22nd May, 1952. (703436.)

12073. British Thomson-Houston Co., Ltd.—Preparation of tungsten and molybdenum carbides. 23rd May, 1951. (703437.)

12566. British Thomson-Houston Co., Ltd.—Electric control circuits using saturable reactors. 29th May, 1951. (703438.) 12567. Saturable reactor apparatus. 29th May, 1951. (703439.)

14363. Osterreichische Elektrizitatswirtschafts- Akt.-Ges.—Protective arrangements for high voltage capacitors. 18th June, 1951. (703371.)

17374. Rotax, Ltd.—Electric snap-action switches. 15th July, 1952. (703449.)

19655. Napier & Son, Ltd., D.—Electrically heated deicing or anti-freezing apparatus. 12th August, 1952. (703374.)

20417. Waugh, A. K.—Electric oil preheater. 14th July, 1952. (703572.)

21405. Board of Trustees of Leland Stanford Junior University.—Electron-discharge devices employing velocity modulation of an electron stream. 28th February, 1948. Divided out of 703324. (703375.)

23265. General Electric Co., Ltd., Smart, N. C., and Field, R. W. G.—Means for evaluating and coding an electrical quantity. 21st August, 1952. (703578.)

24653. National Research Development Corporation.—Piezo-electric arrays for examining materials by ultrasonic irradiation. 14th November, 1951. Divided out of 703480. (703508.)

25439. Licentia Patent-Verwaltungs-Ges.—Selenium rectifiers and methods for their manufacture. 31st October, 1951. (703457.)

25721. National Research Development Corporation.—Methods of testing materials by ultrasonic irradiation. 14th November, 1951. Divided out of 703480. (703511.)

26153. Crossland, Ltd., R. & A. G., and Cocksedge, F. M.—Electric lamp fittings. 4th November, 1952. (703580.)

27562. Chase-Shawmut Co.—Electric current-limiting cartridge fuses. 23rd November, 1951. (703299.)

1952

1303. Cox, D. B.—Electric heating elements. 16th January, 1952. (703584.)

2901. M-O Valve Co., Ltd., and Widdowson, A. E.—Manufacture of refractory electrical insulators. 19th January, 1953. (703464.)

4081. Du Pont de Nemours & Co., E. I.—Methyl methacrylate polymer of electrical conductivity. 15th February, 1952. (703521.)

4120. Standard Telephones & Cables, Ltd.—Circuit arrangements for indirectly heated cathode thermionic valves. 15th February, 1952. (703465.)

4303. Licentia Patent-Verwaltungs Ges.—X-ray tubes. 18th February, 1952. (703387.)

9265. Chase-Shawmut Co.—Current-limiting high capacity electric fuses. 10th April, 1952. (703303.)

11793. British Thomson-Houston Co., Ltd.—Induction motors. 9th May, 1952. (703529.)

14586. Philips Electrical Industries, Ltd.—Variable resistors and inductors. 10th June, 1952. (703597.)

16407. Machlett Laboratories, Inc.—Electron tubes. 30th June, 1952. (703600.)

16498. General Motors Corporation.—Temperature responsive electric switch. 1st July, 1952. Addition to 591634. (703308.)

18095. Sperry Products, Inc.—Ultrasonic inspection devices. 17th July, 1952. (703389.)

20970. General Motors Corporation.—Control system for electro-motive traction. 21st August, 1952. (703604.)

22727. Philips Electrical Industries, Ltd.—Methods of purifying germanium. 10th September, 1952. (703606.)

23078. Fairweather, W. C. (Singer Manufacturing Co.). —Dynamo-electric machines. 15th September, 1952. (703537.)

28971. General Electric Co.—Freezing trays. 17th November, 1952. (703317.)

32368. General Motors Corporation.—Dynamic brake system for electric locomotives. 22nd December, 1952. (703610.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 9th January:—

STAB-LOK. No. 716,037, Class 9. Electric circuit breakers and fitted instrument panels for use in electricity distribution.—Federal Electric Products Co., Newark, N.J., U.S.A. Address for service, c/o Marks & Clerk, 57 & 58, Lincoln's Inn Fields, London, W.C.2.

MEGADICT. No. 719,892, Class 9. Loudspeaking telephonic apparatus and instruments and parts thereof included in Class 9.—Winston Electronics, Ltd., 1, Park Road, Hampton Hill, Hampton, Middx.

METRO-FLEX. No. 722,169, Class 9. Instruments and apparatus operated by electric current control for use in governing the operation of boilers, furnaces, flues and ducts, but not including any such goods for use with domestic gas or coke fired appliances.—Metropolitan Engineering Co., Ltd., 47, Whitechapel High Street, London, E.1.

WESTAMAG. No. 723,250, Class 9. Voltage and electric current regulating apparatus and electrical apparatus included in Class 9 for controlling such regulating apparatus. —Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.

DATHENE. No. 723,387, Class 9. Electric cables and insulated electric wires.—J. Day & Co. (Derby Works), Ltd., Harrow Manor Way, Abbey Wood, London, S.E.2.

SILIT. No. 713,066, Class 11. Refractory pressed elements being thermally or electrically conductive or both thermally and electrically conductive, in block, plate, tubular or bar form, all for the construction of and use in industrial furnaces and electrical heating elements included in Class 11.—Siemens-Planiawerke Aktiengesellschaft für Kohlefabrikate, Meitingen, near Augsburg, Germany. Address for service, c/o G. F. Redfern & Co., Redfern House, Dominion Street, London, E.C.2.

TECA AUTOCRAT. No. 723,222, Class 11. Heating apparatus and cooking apparatus.—G. J. Waple, trading as Technica Electrical Equipment (England), 62, Longmore Avenue, New Barnet, Herts.

Southern Rhodesia's Imports

IMPORTS of electrical machinery and apparatus into Southern Rhodesia showed a further increase as a whole in 1952, the only noteworthy exception being some household appliances. Telephone and telegraph material was in better demand again after a setback in 1951. Great Britain's share of the trade generally was well maintained. The accompanying table gives values in 1952 and notes of increases or decreases on the previous year, together with figures for the chief supplying countries. It will be seen that South Africa has competed in most lines and that Western Germany is in evidence.

Class of Goods	1952 £ (000)	Inc. or dec. on 1951 £ (000)
Electric cable and wire	1,444	− 81
From United Kingdom	725	+ 229
,, South Africa	697	− 120
Lamps and bulbs	131	+ 5
From United Kingdom	85	+ 8
,, South Africa	26	+ 1
,, Netherlands	13	− 2
Telegraph and telephone material	517	+ 287
From United Kingdom	509	+ 292
Radio material and instruments	470	+ 80
From United Kingdom	333	+ 87
,, South Africa	78	− 1
,, Netherlands	28	+ 4
Electric stoves, ranges and parts	187	+ 70
From United Kingdom	105	+ 42
,, South Africa	76	+ 36
Other heating and cooking apparatus	169	− 36
From United Kingdom	112	− 40
,, South Africa	54	+ 6
Electric washing machines	122	− 95
From United Kingdom	116	− 89
,, South Africa	3	+ 1
Other elec. goods and apparatus	692	− 77
From United Kingdom	556	− 22
,, South Africa	90	− 6
,, United States	21	− 41
Batteries	304	+ 59
From United Kingdom	182	+ 74
,, South Africa	100	− 22
Motors and parts	277	+ 64
From United Kingdom	192	+ 46
,, South Africa	55	+ 8
Transformers	358	+ 74
From United Kingdom	327	+ 52
,, South Africa	21	+ 14
,, W. Germany	6	+ 6
Other electrical machinery	1,286	+ 466
From United Kingdom	1,108	+ 354
,, South Africa	96	+ 61
,, United States	29	+ 5
,, W. Germany	3	+ 2

Board Commercial Staff Training

Two further successful five-day training courses for sales representatives, wiring foremen and installation inspectors have just been completed by the South East Scotland Electricity Board. Courses have already been held for district commercial assistants, demonstrators and service centre assistants. Models, films and lantern slides were used to illustrate several of the talks.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Egypt.—CAIRO.—26th January. Ministry of Public Works. 11 kV overhead transmission lines together with associated substations and other equipment. (E.S.B. 11868/53. Ten/7776.)*

Eston. — 18th January. U.D.C. Street lighting equipment. (See this issue.)

Formosa.—TAIPEI.—11th January. Central Trust of China. Twenty 5-7 cu ft refrigerators. (E.S.B. 11521/53. Ten/7765.)*

Hertfordshire.—The County Council invites applications from contractors for inclusion in its approved list. (See this issue.)

India. — AHMEDABAD. — 20th January. Corporation. Four electrically-driven pumping sets. (E.S.B. 11867/53. Ten/7777.)*

Iraq. — BAGDAD. — 31st December. Director General of Municipalities. Two 50 kW diesel electric generating sets. (E.S.B. 11976/53. Ten/7774.)*

Irish Republic.—CARLOW.—7th January. Mental Hospital Board. Electrical installation work at the Mental Hospital. (E.S.B. 11812/53. Ten/7759.)

London. — WANDSWORTH. — 6th January. Borough Council. Street lighting equipment. (See this issue.)

Longbenton.—9th January. U.D.C. Electrical installations in 310 houses. (See this issue.)

New Zealand. — WELLINGTON. — 10th February. Director-General (Stores Division), G.P.O. Electric lamps and suppressors. (E.S.B. 11891/53. Ten/7775.)*

North of Scotland.—Hydro-Electric Board. 132 kV switchgear for Shin substation. (See this issue.)

Portuguese East Africa. — LOURENCO MARQUES.—15th January. Ports, Railways, and Transport Department. Equipment for the electric lighting system of the Port of Beira. (E.S.B. 9248/53. Ten/7773.)*

South Africa. — PRETORIA. — 7th January. Union Tender and Supplies Board. Mobile floodlighting equipment. (E.S.B. 11807/53. Ten/7779.)*

United States.—PORTLAND, OREGON.—12th January. Corps of Engineers, U.S. Army. Supply of 4,160 V heavy duty metalclad switchgear. (E.S.B. 11904/53. Ten/7771.)*

SEATTLE, WASHINGTON.—1st April. Three 345 kV outdoor oil circuit breakers. (E.S.B. 11634/53. Ten/7791.)*

*Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Barking. — Corporation. Recommended. Street lighting on the London-Tilbury Trunk Road (£2,729).—Cohen Bros. (Elect.), Ltd.

Crawley.—Development Corporation. Electrical wiring at extension to sewage treatment works (£3,096).—City Electrical Co.

East Sussex.—Welfare Services Committee. Recommended. Passenger lift at St. Leonard's House, East Grinstead (£3,085).—Y. J. Lovell & Son.

Glasgow.—Police Committee. 100,000 yd of aerial cable (£2,585).—L.P.S. Electrical Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Altrincham. — Houses (112), Broomwood estate; borough surveyor, Town Hall.

Amersham.—Secondary school (£134,500); county architect, Walton Street, Aylesbury.

Ashington. — Houses (14), North Seaton Road estate; U.D.C. surveyor.

Basildon.—Technical school; Denis Clarke Hall, architect, 6, Mason's Yard, Duke Street, S.W.1.

Birkenhead.—Extensions to pathological laboratory and physiotherapy department, St. Catherine's Hospital; T. Mitchell, architect, 88, Church Street, Liverpool.

Birmingham.—Police garage, stores, etc., Duke Street; city engineer.

Border.—Houses (71), Dalston, for R.D.C.; housing officer, 5, Victoria Place, Carlisle.

Brentford.—Offices for Alfa-Laval Co., Ltd., Great West Road; W. S. Try, Ltd., builders, Cowley, Uxbridge.

Brierley Hill.—Houses (135), Forge Lane estate; J. R. Moore, housing director, Council Offices, Moor Street.

Bristol.—Aged persons' hostel, Manor Farm estate (£34,000); city architect.

Showrooms and offices, Lower Castle Street; Wilkins & Coventry, Ltd., 91, Cumberland Road.

Cardiff. — Primary school, Llanrumney; Gordon H. Griffiths, architect, 2, Museum Place.

Chelmsford.—Free Church building, Pentland Avenue; Basil I. Briggs, architect, 7, Station Chambers, High Street North, London, E.6.

Chichester.—Garage, Basin Road; Southdown Motor Services, Ltd., Ship Street, Brighton.

Factory, Terminus Road; Auto Body Repairs, Ltd., Birdham Road.

Cumberland.—Old people's hostel at Papcastle, health centres at Penrith and Whitehaven, fire station at Egremont, and remodelling of Whitehaven police station; county architect, Portland Square, Carlisle.

Eastbourne.—Houses (108) and flats (21), St. Philip's Avenue and Langley Road; borough surveyor.

Eastry. — Houses (60); surveyor, R.D.C. Offices, Dover Road, Sandwich.

Frome.—Houses (25), Nunney and Great Elm; H. H. Goldsmith, architect, 18, Gay Street, Bath.

Great Yarmouth.—Rebuilding premises of Missions to Seamen, South Quay; Olley & Haward, architects, 5, Queen Street.

Flats and maisonnettes (62), Middlegate Street; borough surveyor.

Grimsby.—Dairy, Victoria Street; Clover Dairies, Ltd., Charles Street, Hull.

Hartlepool.—Flats (30), Coverdale Street; borough engineer.

Hither Green. — Crematorium; borough engineer, Town Hall, Catford, S.E.6.

Huntingdon.—Proposed outpatients' block; regional architect, South West Hospital Management Committee, Huntingdon Hospital.

Ilford. — Caterham Secondary School (£125,000); borough architect.

Houses (34), Torquay Gardens; Suburban Developments (Ilford), Ltd., 667, Eastern Avenue.

Kempston.—Occupational centre at Austin Canons; S. C. Jury, Beds. county architect, Shire Hall, Bedford.

Leatherhead.—Works extensions for Ronson Products, Ltd.; Taylor Woodrow, Ltd., contractors, Adrienne Avenue, Southall.

Leyton.—Dwellings (40), Snaresbrook Road; Police Architect's Department, New Scotland Yard, S.W.1.

Rebuilding Ruckholt Road Secondary School (£99,000); D. J. Osborne, Town Hall, Leyton, E.10.

Liverpool.—Store and offices; E. H. Davie, architect, 77, Grosvenor Street, W.1.

London. — Mayfair. — Offices, 3, Berkeley Square; Beacon Insurance Co., Ltd., 33, King Street, E.C.2.

Upper Holloway. — Secondary school (£210,000); Halse & Son, Ltd., builders, 5, Chapel Hill, S.E.18.

Wandsworth. — Houses (109), West Hill, Putney; Sir Lancelot Keay, architect, 80, Wimpole Street, W.1.

Westminster. — Extension to Warrington Works; British Aluminium Co., Ltd., Norfolk House, St. James's Square, S.W.1.

Manchester.—First stage of health centre, Hill Lane, Baguley (£25,000), 1954/55 programme; city architect.

Mangotsfield. — Secondary modern school; county architect, Shire Hall, Gloucester.

Newcastle-on-Tyne. — Factory, Brinkburn Street, for United Wire Works, Ltd.; Stanley Miller, Ltd., builders, North Street.

Brew house, Orchard Street, for Northern Clubs Federation Brewery (£400,000); C.W.S. Building Department, contractors, West Blandford Street.

Primary school, Fawdon; Curley and Edwards, quantity surveyors, Eldon Square.

North Riding. — Police headquarters at Whitby (£43,000); county architect, County Hall, Northallerton.

Ormskirk. — Houses (190), Wigan Road; U.D.C. surveyor.

Oxford.—Aged persons' hostel, Barton End; city architect.

Penrith.—Car showrooms and service station for Ross Motors, Ltd.; W. Lancaster, architect, 18, Carleton Drive.

Plymouth. — Showrooms, workshops and offices, Millbay Road; Pearn Bros., Ltd., Radnor Street.

Rothwell.—Flats (40), Wood Lane; R. A. Easdale & Son, architects, County Chambers, Bradley Street, Castleford.

St. Neots.—Houses (44), Eynesbury; R.D.C. architect.

Seaton Valley. — Houses (700), between Seaton Delaval and Holywell; U.D.C. surveyor, Council Offices, Seaton Delaval.

Sedgefield. — Houses (130), Ferryhill; housing architect, R.D.C. Offices.

Sedgley. — Proposed Civic Centre and Memorial Hall; A. R. Young, architect, 188, High Street, Dudley, Worcs.

Smethwick.—Dwellings (91), Stanhope Road; borough engineer.

Southall.—Flats (33), Lady Margaret Road and Neal Avenue; borough engineer.

South Shields.—Additions to Redwell Lane Secondary, Cleadon Park Secondary, Mortimer Road Junior Mixed and Mortimer Road Infants' Schools; borough engineer.

Staffordshire.—Fire stations at Kinver, Uttoxeter and Brewood and Biddulph (£41,000); A. C. H. Stillman, county architect, Martin Street, Stafford.

Staines.—Dwellings (54), Convent estate; U.D.C. surveyor.

Sunbury-on-Thames. — Houses (40) and bungalows (6), Ashford Common; T. L. Watts, clerk, U.D.C. Offices.

Tettenhall.—Shops and maisonnettes, School Road, Tettenhall Wood; J. W. Mason, surveyor, U.D.C. Offices, Upper Green.

West Bromwich.—Additional classrooms at Harvills Hawthorn C.P. School; W. B. Bond, quantity surveyor, 3, Newhall Street, Birmingham.

West Ham.—Maisonnettes (74) and flats (20), Charford Road area and in Trinity Street; G. E. Smith, town clerk, Town Hall, Stratford, E.15.

Wilton.—Flats (29), Fancy Row; borough surveyor.

ELECTRICAL REVIEW

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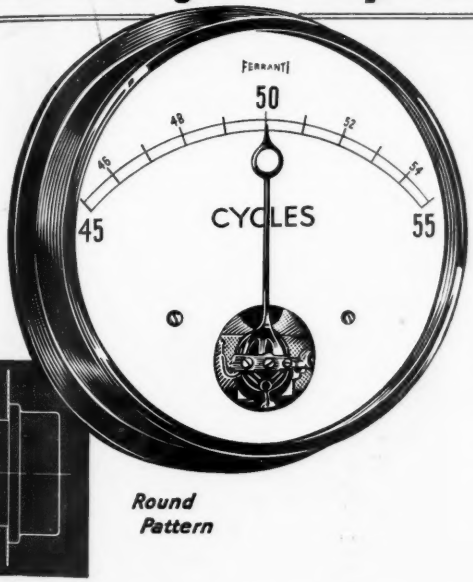

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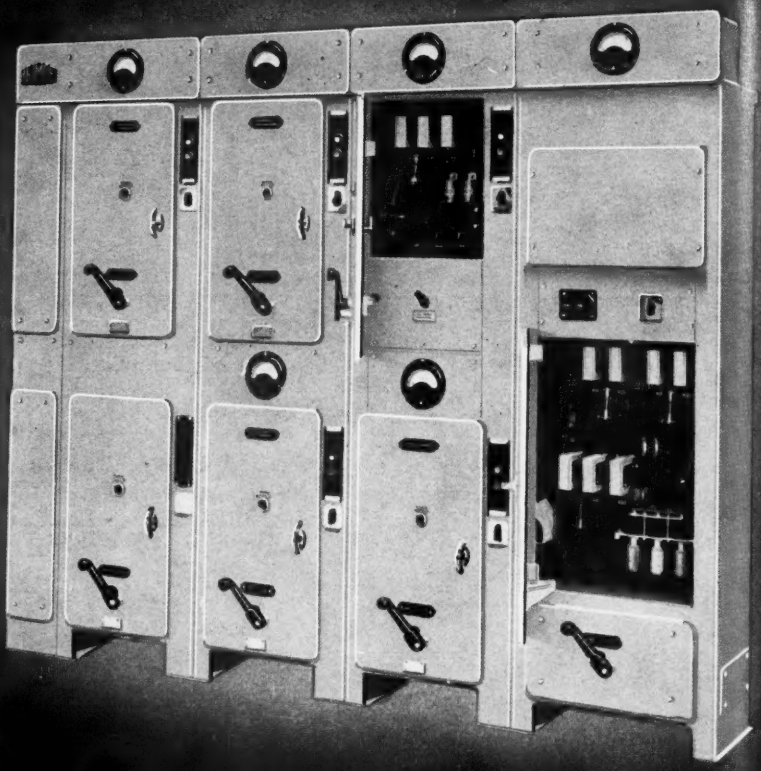

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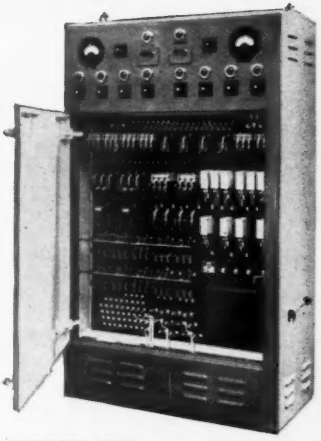

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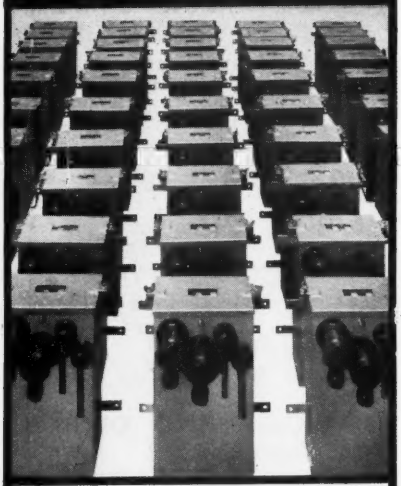

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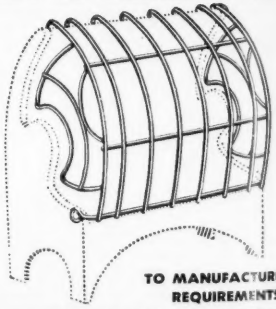

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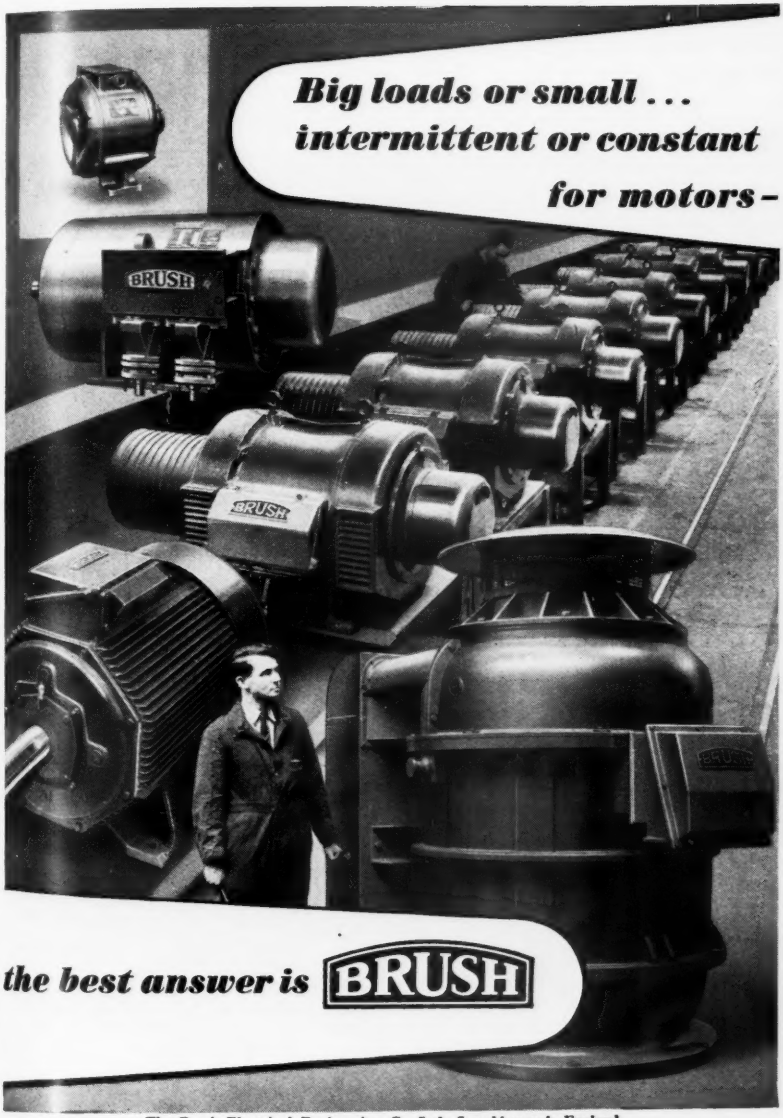

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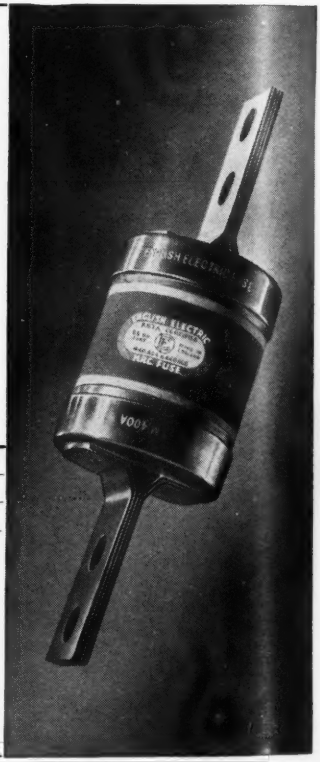

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200	TF200	251	933	2033
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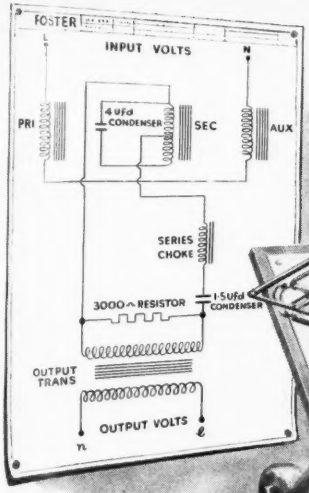

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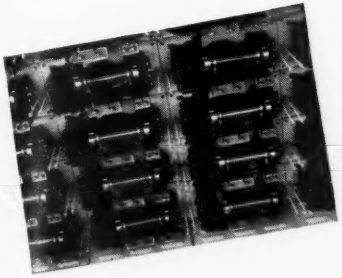

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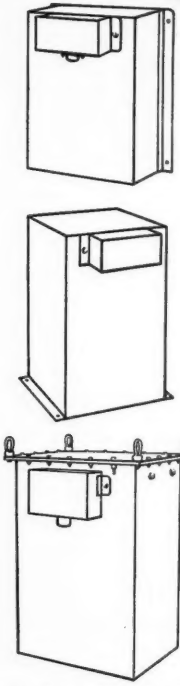

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5	2.0 kVAr	2.0 kVAr	2.0 kVAr	2.2 kVAr	2.2 kVAr	2.2 kVAr
7.5	2.0 ,,	2.0 ,,	3.0 ,,	2.2 ,,	2.2 ,,	3.25 ,,
10	3.0 ,,	4.0 ,,	4.0 ,,	3.25 ,,	4.3 ,,	4.3 ,,
15	3.0 ,,	4.0 ,,	5.5 ,,	3.25 ,,	4.3 ,,	6.0 ,,
20	4.0 ,,	5.5 ,,	5.5 ,,	4.3 ,,	6.0 ,,	6.0 ,,
25	5.5 ,,	7.0 ,,	7.0 ,,	6.0 ,,	7.5 ,,	7.5 ,,
30	7.0 ,,	9.0 ,,	9.0 ,,	7.5 ,,	9.7 ,,	9.7 ,,
40	11.0 ,,	11.0 ,,	11.0 ,,	11.8 ,,	11.8 ,,	11.8 ,,
50	11.0 ,,	11.0 ,,	15.0 ,,	11.8 ,,	11.8 ,,	16.0 ,,
60	15.0 ,,	15.0 ,,	15.0 ,,	16.0 ,,	16.0 ,,	16.0 ,,
75	15.0 ,,	20.0 ,,	20.0 ,,	16.0 ,,	21.6 ,,	21.6 ,,
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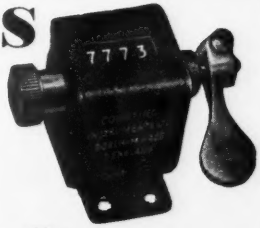

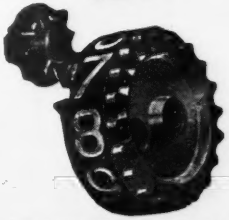

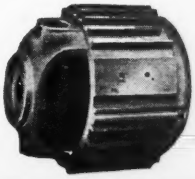

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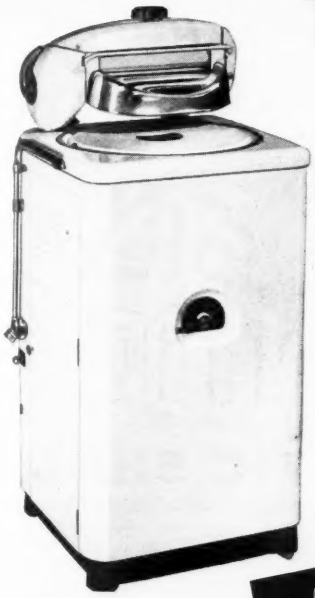

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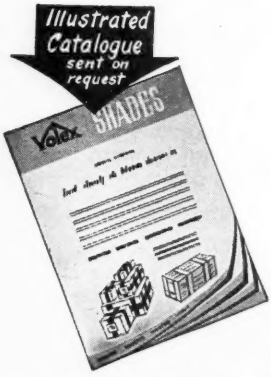

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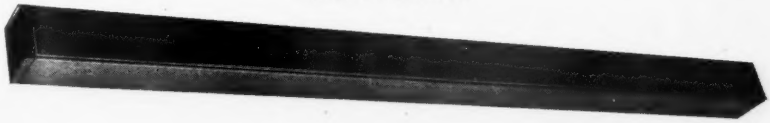

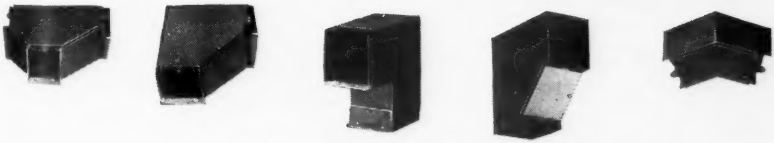

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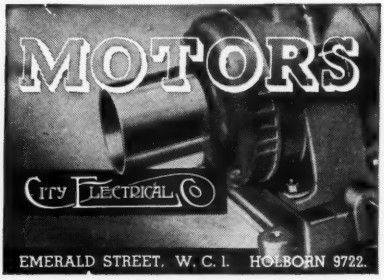

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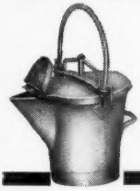

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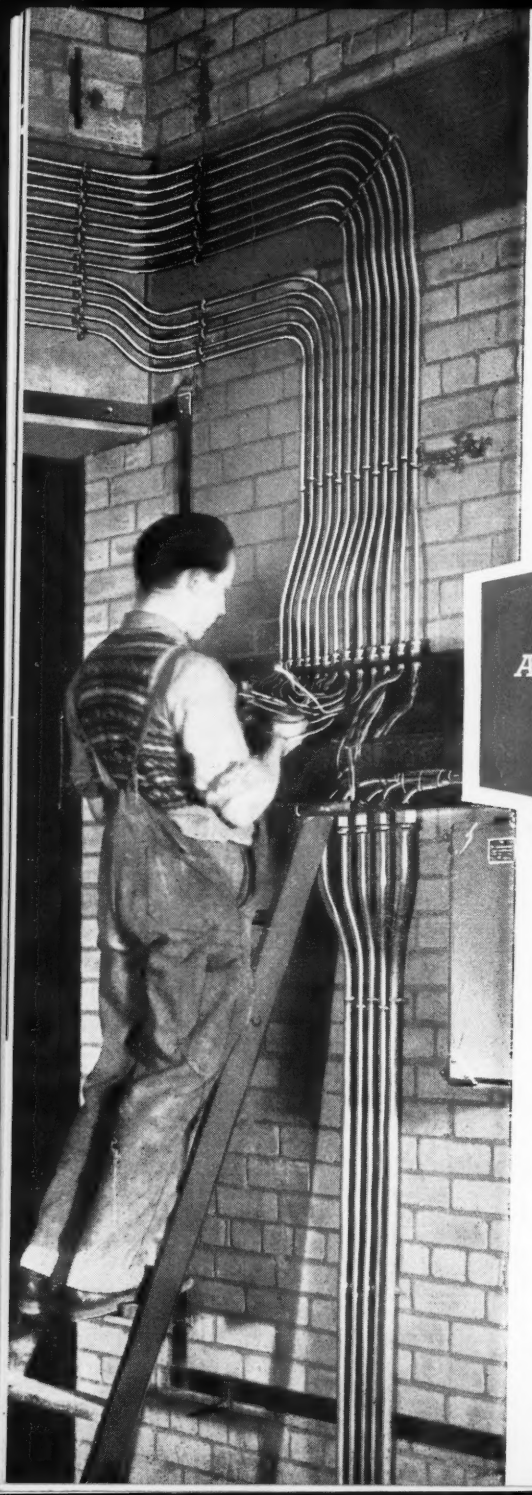

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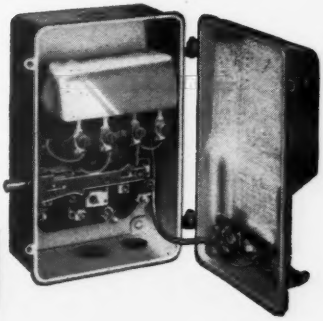

Closed View showing pushbuttons in lid.

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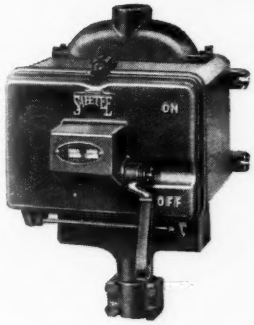

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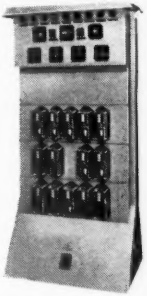

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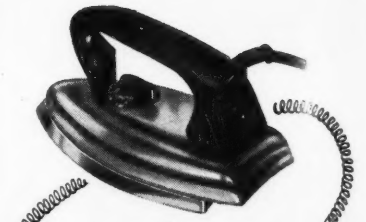

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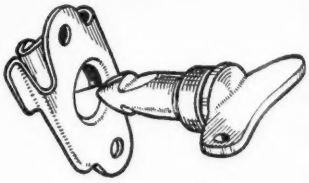

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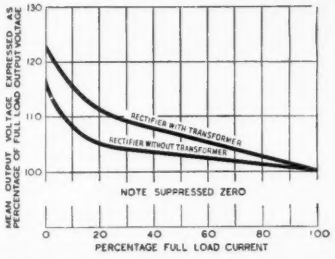

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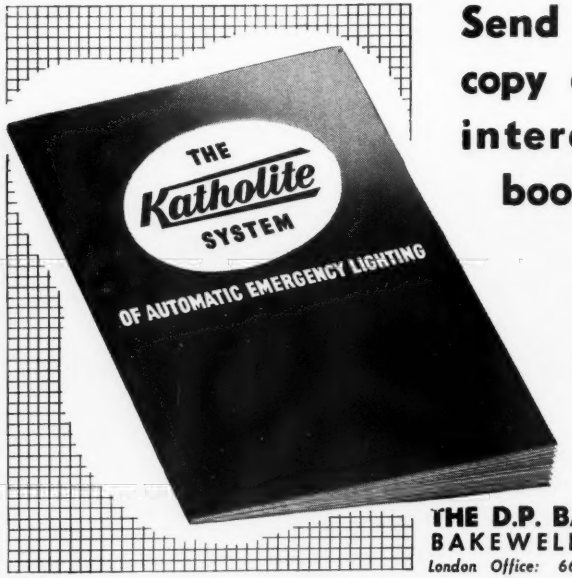

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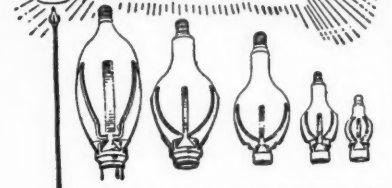

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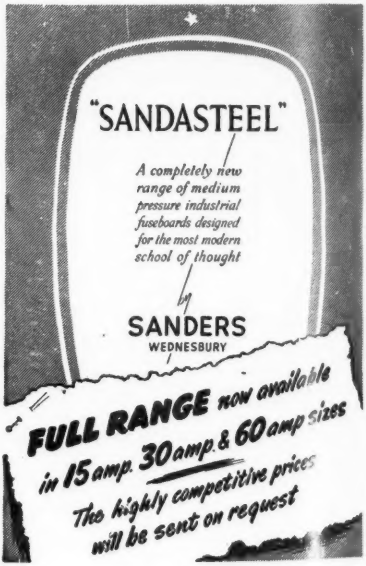
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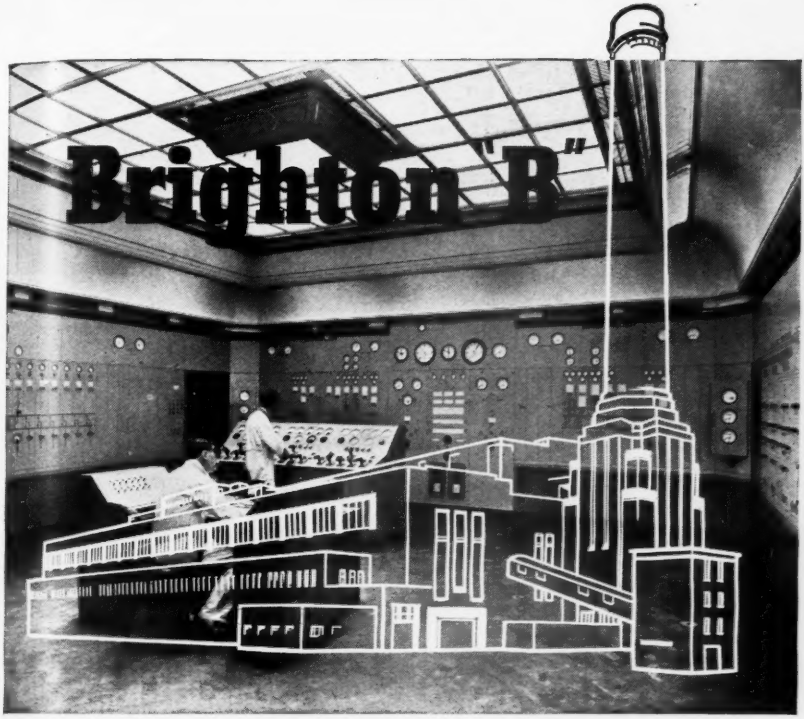

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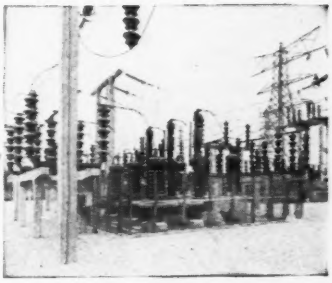

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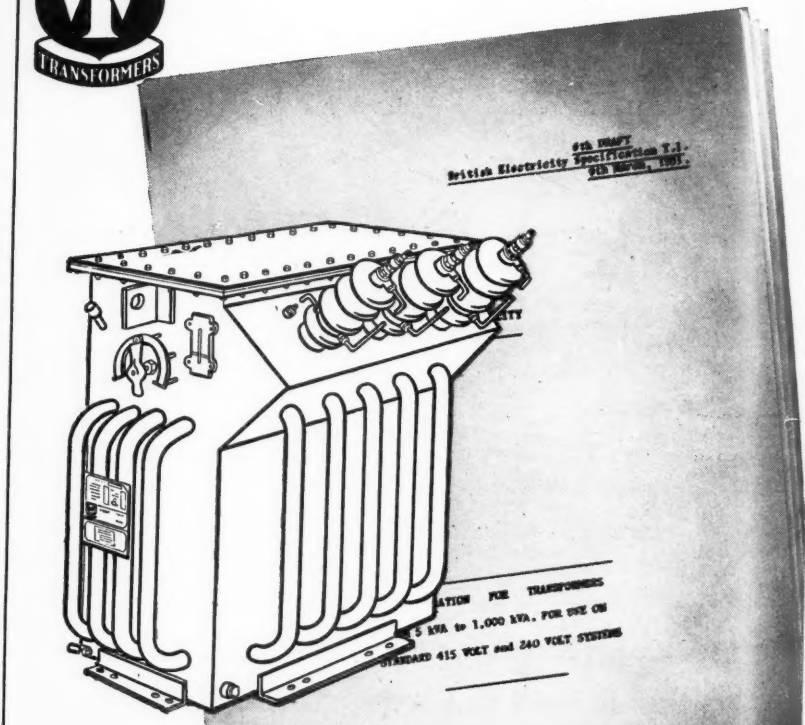

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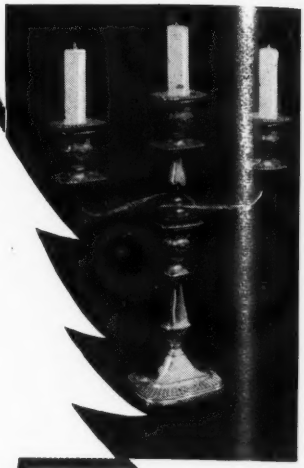

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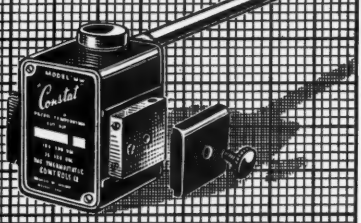

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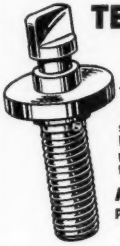

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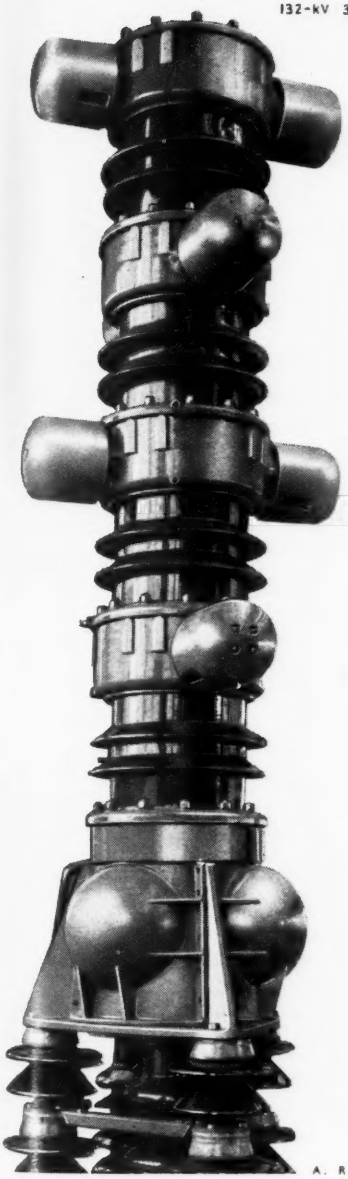

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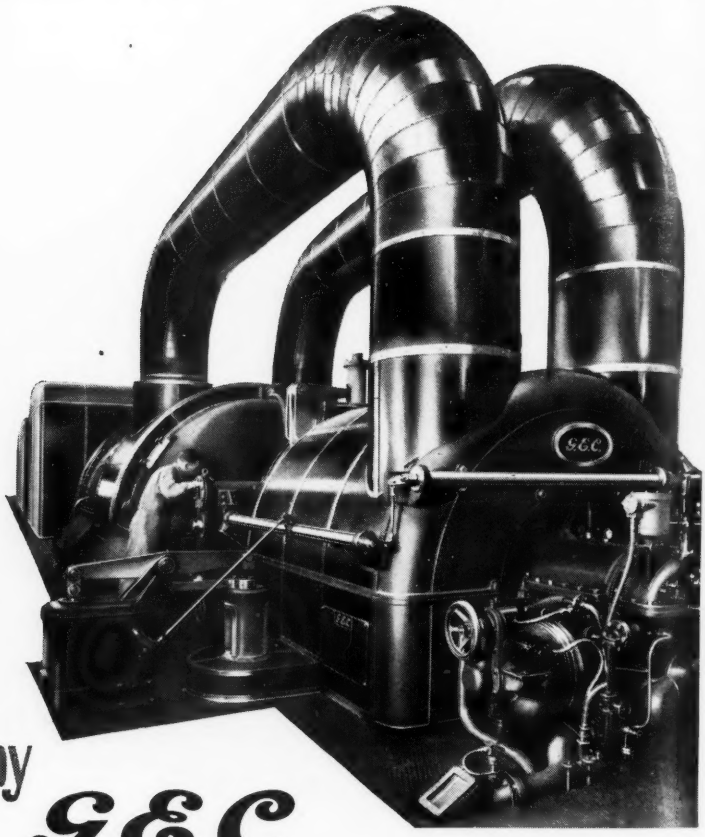

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ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

CLASSIFIED advertisements are PREPAID. With the issue of 1st January the type area of advertisement pages will be increased to 10 × 7 inches and the following rates will apply: 3/- per line (approx. 6 words), where an advertisement includes a Box Number this counts as two words and carries an additional charge of 1/-. **DISPLAYED** £2 per inch, per insertion. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

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REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

LONGBENTON URBAN DISTRICT COUNCIL

Electrical Installations-Conversions

THE Council invite tenders from Registered Electricians for Electrical Installations-Conversions Schemes at Forest Hall. The work is as follows:—

Contract No. 39: 310 Houses at Myrtle Crescent, Glebe Crescent, Glebe Road, Glebe Terrace, Lansdowne Road, Highfield Avenue, Fairfield Avenue, Oak Grove, Delaval Road and Holly Avenue.

General conditions, specification, schedules and form of tender can be obtained from Mr. A. E. Sweetman, M.I.Mun.E., Engineer and Surveyor, Council Offices, Forest Hall, Newcastle-on-Tyne, on payment of a deposit of £2 2s., returnable only upon receipt of a bona fide tender, not subsequently withdrawn, and the return of all documents.

Drawings can be inspected at the office of the Engineer and Surveyor, but tenderers are advised to examine the houses prior to the submission of their tender.

Sealed tenders in plain envelopes, endorsed "Electrical Installations-Conversions," must be delivered to the undersigned not later than 10 a.m. on 9th January, 1954.

The Council do not bind themselves to accept the lowest or any tender and reserve the right to divide the contract should they so desire.

(Signed) G. HARRISON,
Clerk of the Council.

Council Offices,
Forest Hall, Newcastle-on-Tyne. 904

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132-kV Switchgear for Shin Substation

TENDERS are invited for 132-kV switchgear and ancillary equipment for Shin Substation. Copies of the tender document may be obtained from the Engineers, Messrs. Kennedy & Donkin, 12, Caxton Street, London, S.W.1, on receipt of a deposit of £2 2s. (returnable).

The Board do not bind themselves to accept the lowest or any tender.

W. D. D. FENTON,
Secretary.

16, Rothesay Terrace,
Edinburgh, 3. 899

METROPOLITAN BOROUGH OF WANDSWORTH

(i) Supply of Street Lighting Equipment
(ii) Erection of Street Lighting Equipment

TENDERS are invited for the two above-mentioned contracts for Group A and B Street Lighting. Tender forms, etc., which are obtainable from the Borough Engineer, must be returned to me by noon, Wednesday, 6th January, 1954.

R. H. JERMAN,
Town Clerk.

Municipal Buildings,
Wandsworth, London, S.W.18. 917

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Copies of the specification, bills of quantities and form of tender may be obtained from N. C. Harrison, Esq., A.M.I.C.E., M.I.Mun.E., Engineer and Surveyor, Normanby Road, South Bank, Middlesbrough, on payment of a deposit of two guineas, which will be refunded on receipt of a bona fide tender (not subsequently withdrawn) or the return of the documents before the closing date for the receipt of tenders.

The relevant plans and general conditions of contract may be inspected at the office of the Engineer and Surveyor during normal working hours.

Tenders in plain sealed envelopes, which may bear the endorsement "Tender for Street Lighting," but must not bear any name or mark indicating the sender, must reach me by noon on Monday, 18th January, 1954.

The Council do not bind themselves to accept the lowest or any tender.

T. MYRDDIN BAKER,
Clerk of the Council.

Council Offices,
Grangetown-on-Tees.
15th December, 1953. 926

CONTRACTS

THE HERTFORDSHIRE COUNTY COUNCIL invite applications for inclusion on their Approved List of Contractors for building and maintenance works, heating and electrical works, fencing works, etc. Tenders will normally be invited from a number of firms on the list, but the County Council reserve the right to ask for other tenders.

Application forms from the Clerk of the County Council, County Hall, Hertford. Contractors who have already applied for inclusion on the list need not apply again. 898

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The engagement of persons answering these advertisements must be made through the Local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order, 1952.

SOUTH EASTERN ELECTRICITY BOARD

SENIOR ASSISTANT ENGINEER, Mid-Sussex Sub-Area Headquarters. Salary £1,026 to £1,071, in accordance with Class J, Grade 4, of the N.J.B. Agreement. Superannuable.

Applicants should be Corporate Members of the I.E.E. and should have had a sound training in distribution engineering followed by experience in the construction, operation and maintenance of overhead and underground systems up to 33 kV.

Applications giving the names of 2 referees should reach H. Pryce-Jones, J.P., M.Eng., M.I.C.E., M.I.E.E., Mid-Sussex Manager, SEEBoard, Mid-Sussex House, North Rd., Brighton, 1, by Monday, 4th January, 1954.

A. L. BURNELL,
Secretary. 907

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

GENERAL ASSISTANT ENGINEER, APPARATUS & MOTOR SECTION, SUB-AREA HEADQUARTERS, BIRMINGHAM & DISTRICT SUB-AREA. The duties involve the supervision of the Apparatus Section workshops dealing with the overhaul and reconditioning of domestic, industrial and commercial electrical apparatus, including refrigerators; also the preparation of investigations and test reports on special apparatus and problems arising from the work of the section. General engineering and workshop experience essential and technical qualifications desirable. Salary £692 per annum (N.J.B. Class N, Grade 13).

Apply in writing within 14 days, stating age, experience, present salary and position, to Sub-Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

GENERAL ASSISTANT DISTRICT ENGINEER, CHELTENHAM DISTRICT, CENTRAL GLOUCESTERSHIRE SUB-AREA. Experience necessary in all branches of distribution work, including the operation and maintenance of high and low voltage underground and overhead distribution systems. Technical qualifications desirable. Salary £524/£540 p.a. (N.J.B. Class E, Grade 11).

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SHROPSHIRE AND HEREFORDSHIRE SUB-AREA.

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER, LEOMINSTER DISTRICT. Applicants should have had a sound technical training with experience in the sale and installation of domestic and commercial equipment and associated wiring. The duties also include advising consumers in respect of new supplies, extensions and alterations on both rural and urban systems. Technical qualifications desirable. Salary £527/£550 per annum (N.J.B. Class B, Grade 8).

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER, LUDLOW DISTRICT. Duties include advising consumers in respect of supplies and extensions and the sale and installation of domestic and commercial electrical equipment and the wiring associated therewith. Technical qualifications desirable. Salary £531/£547 per annum (N.J.B. Class D, Grade 10).

JUNIOR ENGINEER, HEREFORD DISTRICT. Applicants should have had a sound technical training, with practical experience in the sale and installation of domestic and commercial electrical equipment and associated wiring. Salary £390 per annum (N.J.B. Class E, Grade 15).

Apply in writing within 14 days, stating age, experience, present salary and position, to Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary. 906

LONDON ELECTRICITY BOARD

Training Centre Supervisor

APPLICATIONS are invited for the above position at the Board's Training Centre in City, E.C.4. This Centre will provide mainly basic workshop training for apprentices, but there will also be facilities for other types of training courses.

The Supervisor will work closely with the Education and Training Officer regarding the recruitment, selection and reporting of apprentices. He will be required to give instruction, to lecture and to be responsible for the general organisation of the Centre, including the supervision of the Apprentice Instructors and the creation of appropriate training syLabuses. Candidates should have had a sound engineering training, should be proficient in the use of hand and machine tools, and should have had experience of instructing in the basic workshop skills. Previous work of this nature in a technical college would be an advantage.

The post is graded under Schedule C of the National Joint Board Agreement as Class AX/DX, Grade 5, Third Assistant Engineer, and the salary range will be from £740 5s. per annum to £900 18s. per annum, inclusive of London allowance. The commencing salary within the range will be in accordance with qualifications and experience.

Application forms from Secretary, 46, New Broad Street, London, E.C.2, to be returned completed within 14 days of the publication of this vacancy. Please enclose addressed envelope and quote ref. V/1694/R. 916

BRITISH ELECTRICITY AUTHORITY

TRANSMISSION DESIGN BRANCH, Headquarters, London, require:—

1. POWER CIRCUIT ENGINEER to co-ordinate the work of two small groups of engineers responsible for the design, specification and testing of overhead lines and cables. Candidates should have special experience with one of these types of equipment and some knowledge of the practice and principles associated with the other. Good personality and initiative to keep abreast of modern developments is of first importance. Provisional salary £1,525 inclusive.
2. OVERHEAD LINES ENGINEER to take charge of a small group of engineers responsible for the design, specification and testing of overhead line structures, conductors and fittings. Candidates should have extensive experience in all aspects of overhead line technology and practice, particularly the design, construction and testing of line structures for E.H.V. operation. Provisional salary £1,325 inclusive.

Candidates should preferably be Corporate Members of the I.E.E. Permanent salary scales are under negotiation and when agreed will be applied retrospectively to date of appointment.

Forms from D. Moffat, Director of Establishments, British Electricity Authority, Winsley Street, London, W.1, to be returned by 11th January, 1954. Quote reference ER/434. 880

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Ayrshire Sub-Area

Appointment of Second Assistant District Engineer, Ardrossan District

APPLICATIONS are invited for the position of SECOND ASSISTANT DISTRICT ENGINEER in the Ardrossan District of the above Sub-Area.

Applicants should be Graduates of the Institution of Electrical Engineers or hold equivalent technical qualifications. Experience in the operation, maintenance and construction on H.V. and L.V. overhead and underground distribution systems and substations essential.

Salary and conditions in accordance with the National Joint Board Agreement, Schedule A, Grade 7, Class E, £649/£681 per annum, subject to statutory deductions, including income tax and superannuation.

The successful candidate will be required to reside in a house provided by the Board in the Burgh of Largs about twelve miles from the District Office, Ardrossan.

Forms of application may be obtained from the undersigned, and should be returned to me duly completed with any additional information not later than 4th January, 1954.

A. E. ROOTS,
Manager.
Greenholm Street, Kilmarnock,
15th December, 1953. 930

BRITISH ELECTRICITY AUTHORITY

Midlands Division

ASSISTANT CHEMIST is required in the Divisional Laboratory at Birmingham. National Joint Board service conditions, superannuable appointment, salary within Schedule C, Grade 8 of the Agreement, commencing in range £501 to £639, ultimately rising to £694.

A sound general knowledge of analytical chemistry is required, and preferably industrial experience. The possession of a university degree or A.R.I.C. would be an advantage.

Apply on Form AE6, quoting Vacancy No. 562MD, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham 13, by 9th January, 1954. 882

SURREY EDUCATION COMMITTEE

Kingston Technical College, Kingston Hall Road, Kingston-upon-Thames

APPLICATIONS are invited for COLLEGE MAINTENANCE ENGINEER. Duties will include general maintenance work throughout the College building, including laboratories and workshops of the Science and Engineering Departments as required. Experience in engineering industry essential, ability to operate lathe, general knowledge of mechanical, heating and electrical installations desirable. Salary scale £420-£495 plus London weighting £30 p.a., if over 26. Post superannuable.

Applications to be sent immediately to Principal. 905

EASTERN ELECTRICITY BOARD

Chief Commercial Officer's Department

Assistant (84/53.R)

APPLICATIONS are invited for the appointment of an ASSISTANT in the Chief Commercial Officer's Department at Wherstead.

Applicants should by training and experience be thoroughly acquainted with general commercial practice and able to analyse statistical data, and should have had experience of office routine, supervision of filing, preparation of minutes and records of meetings (for which a knowledge of shorthand would be an advantage).

The salary for this appointment will be in accordance with Grade 6 (£700 × £25 to £775) of the National Joint Council Salary Agreement. Future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Chief Commercial Officer, Eastern Electricity Board, Wherstead, Ipswich, Suffolk, within fourteen days of the appearance of this advertisement. 927

HER MAJESTY'S COLONIAL SERVICE

Generation Engineer, Nyasaland

DUTIES include maintenance and operation of steam power and diesel plant. Commencing pay (inclusive of allowances) £1,458 in a scale rising to £1,710 per annum to suitably qualified and experienced candidate.

Appointment will be on three years' probation for pensionable employment. Free passages, once each way each tour, to officer, his wife, and children up to the cost of one adult passage. Quarters, if available, are provided at low rent and leave is granted at the rate of 5 days for each month of service after a tour of two to three years.

Candidates, not over 40 years of age, should be corporate members of one or more of the recognised engineering institutions and should be familiar with the operation and maintenance of modern medium pressure steam power plant.

Apply in writing to the Director of Recruitment, Colonial Office Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number CDE.145/4/01. 918

DRAUGHTSMEN

THE ENGLISH ELECTRIC CO. LTD., STAFFORD, have vacancies for DRAUGHTSMEN to work on a wide variety of heavy electrical machines, including the largest water and steam driven alternators and mill motors. These are interesting positions offering prospects of advancement.

Write, quoting Ref. 74D, to Dept. C.P.S., 336/7, Strand, London, W.C.2.

711

BRITISH ELECTRICITY AUTHORITY

South East Scotland Division

GENERAL ASSISTANT ENGINEER (Telecommunications) required in the Technical Department at Divisional Headquarters, Portobello.

Applicants should possess H.N.C. or equivalent and have experience in installation and maintenance of automatic telephone equipment employing both D.C. and V.F. signalling. Some knowledge of carrier frequency equipment and V.H.F. radio would be an advantage.

Salary scale £501-£656 per annum (N.J.B. Class AX/BX/8). Placed according to experience. Pension scheme.

Apply in writing by 8th January, 1954, to Divisional Controller, British Electricity Authority, South East Scotland Division, British Electricity House, High Street, Portobello, Midlothian. 879

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the post of SHIFT CHARGE ENGINEER at BRIMSDOWN "A" GENERATING STATION. Salary Class F, Grade 7, £697-£718 per annum plus London weighting.

Applicants should have served an apprenticeship and obtained an Ordinary National Certificate in Electrical and/or Mechanical Engineering or equivalent. Experience in the operation of power station plant at high steam pressures will be an advantage.

Apply by 31st December, 1953, giving age and details of qualifications and experience, to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, London, N.14.

W. N. C. CLINCH,
Controller. 901

BRITISH ELECTRICITY AUTHORITY

Midlands Division

SHIFT CHARGE ENGINEERS are required at (a) Stoke and (b) Stafford Generating Stations. N.J.B. service conditions, superannuable appointment, salaries within Schedule A of the Agreement, commencing at (a) £649 and (b) £559 per annum.

Applicants should have had experience in the operation and control of steam generating plant and main switchgear or mechanical and electrical experience at a manufacturers' works. Qualified marine engineers with electrical experience would be considered. Appropriate technical qualifications an advantage.

Apply on Forms AE6, quoting Vacancy Numbers (a) 560MD and (b) 561MD, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 2nd January, 1954. 881

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the position of HEAD OF THE OPERATION & MAINTENANCE SECTION of the Chief Engineer's Department at Carliol House, Newcastle upon Tyne.

Applicants must be appropriately qualified electrical engineers and have wide experience in the operation and maintenance of large distribution systems. The person appointed will be responsible to the Chief Engineer for co-ordinating operation and maintenance practice in the Board's Area. Provisional salary, subject to scales negotiated for N.J.M.H.E. Grade, £1,500/£1,850 p.a., according to experience.

Applications, stating age, qualifications and experience, should be marked "Confidential," and forwarded to the Secretary (Establishments), North Eastern Electricity Board, Carliol House, Newcastle upon Tyne, to arrive not later than 2nd January, 1954. 900

NORTH WESTERN ELECTRICITY BOARD

Appointment of Electrician (Telephone), Chief Engineer's Dept., Area Board Headquarters, Manchester, 8

APPLICANTS should be experienced in automatic telephone exchange maintenance. Knowledge of V.H.F. radio and ability to repair and maintain telecommunication apparatus would be an advantage.

The person appointed will normally be located at the Board's Testing Station, Tully Street, Salford, but will be required to assist in the maintenance of equipment in other districts.

Rate of pay 44.0d. per hour for a 44-hour, 5-day week. N.J.I.C. conditions.

Applications to Establishment Officer, North Western Electricity Board, Cheetwood Road, Manchester, 8, by 2nd January, 1954. 919

ATOMIC ENERGY RESEARCH ESTABLISHMENT (HARWELL) AND ATOMIC WEAPONS RESEARCH ESTABLISHMENT (ALDERMASTON)

Draughtsmen

OPPORTUNITIES exist on a wide variety of mechanical, electro-mechanical, electronic and chemical plant work. Vacancies include posts in higher grades. Hostel accommodation available. Reasonable housing prospects for married applicants.

Write stating age, experience, qualifications and present salary to Establishment Officer, A.E.R.E., Harwell, Nr. Didcot, Berks. 878

TRANSFORMER REPRESENTATIVE
required immediately to represent London Company making small Transformers and Electro-Magnets. Resident in the Midlands. Age 25-35. Good salary, expenses, commission. Preferably car owner.—Box 856.

APPLICANTS are invited for the post of trainee-executive with an established firm of miniature lamps, principally motor bulbs, in the London area. Applicants should be between 22 and 30 and should have good education. The position calls for a man in this trade with initiative and ability to assimilate detail over a wide range of subjects in the modern commercial practice. Applications, with fullest details, to the Managing Director—Box 867.

APPLICATIONS are invited by the General Electric Co. Ltd. to fill vacancies in their fittings design office. Attractive salary and prospects for men with initiative. Initial applications should give as much information as possible of experience and qualifications. Apply in writing to—Staff Department, Magnet House, Kingsway, London, W.C.2. 884

APPLICATIONS are invited for the post of mechanical engineer in Ceylon with an old-established engineering firm with head offices in London. Applicants, who should be unmarried and not older than 25 years of age, should have received a full-time apprenticeship training in general engineering, and also have had drawing office experience and be fully conversant with drawing office procedure. Commencing remuneration according to qualifications and experience, but not less than £1,000 per annum with good prospects. Terms of service include first class steamer passage and periodic furlough in the U.K. Liberal provision made for retirement at age of 55. Applicants are invited to apply in writing giving particulars of training and experience to Box De/40, c/o 95, Bishopsgate, London, E.C.2. 883

ASSISTANT to development engineer required; sound knowledge electrical theory; model making ability essential. Apply in writing to—Chilton Electric Products Limited, Hungerford, Berks. 920

CANADA. An excellent opportunity exists for a qualified electrical engineer with a sound practical background in electricity and mechanics as a service engineer for industrial electric trucks in the Montreal area. He should be prepared to emigrate after a period of training at the manufacturer's factory in England and should speak French fluently. Non-French-speaking applicants will be considered for a similar post in the Toronto district of Canada, which post is likely to become vacant a little later in 1954. Salary in Canada $4,500 per year. Reasonable living expenses refunded whilst training in England. Apply in own handwriting giving details of age, past experience, qualifications, present salary, to—Box 841.

COVENTRY CORPORATION require clerk of works to supervise electrical contracts. A.P.T. IV (£555-£600) plus £26 p.a. local award in approved circumstances. Application forms and conditions from City Architect, Bull Yard, Coventry, to be returned by 4th January. 902

DETAIL draughtsman with shop experience and design knowledge for work on light steel structures in London. 5-day week. Pension fund. Apply in writing, stating age, experience, qualifications and salary required, to—The Staff Officer, British Insulated Callender's Construction Co. Ltd., 21, Bloomsbury Street, London, W.C.1. 887

DEVELOPMENT engineer required for work in connection with high-voltage engineering. Applicants should be of degree standard and preferably with some experience of development and testing work in this field. This is an excellent opportunity for a young engineer to acquire experience and to extend his knowledge. The conditions of employment include a non-contributory staff pension scheme and there are good opportunities for advancement. Please apply giving full details of education, training, experience, age, salary, etc., to—The Chief Personnel Officer, The Brush Electrical Engineering Co. Ltd., Loughborough, Leics. 824

ELECTRICAL design engineer, age 25-30, required. Minimum qualifications university degree in electrical engineering or Higher National Certificate. Knowledge of rolling mill electrical equipment and experience with large electrical manufacturing company essential. Applications stating age, qualifications, experience and salary required should be sent to—Personnel Officer, Davy and United Engineering Co. Ltd., Park Iron Works, Sheffield, 4. 928

ENGINEER sales representative required for London area by an old-established firm of carbon brush manufacturers. Applicants should have a knowledge of machine design, preferably with sales experience, and be willing to undergo training for subsequent responsible position.—Box 921.

ELECTRICAL contractor in London requires a man experienced in the preparation of invoices for large contracts. State details of experience, age and salary required in confidence to—Box 9640.

ELECTRICAL draughtsman. Young man required for works electrical department, having experience in wiring and circuit diagrams, cable and distribution layouts for large engineering works. Successful applicant to be responsible to electrical superintendent. Application giving relevant details to—Personnel Manager, Ruston-Bucyrus Ltd., Excavator Works, Lincoln. 885

ELECTRICAL engineer, A.M.I.E.E. or exemption examination. Aged 27/38 years, possessing a comprehensive knowledge of electrical installation work in all types of buildings, including factories, hospitals, schools, cinemas, etc., and fully conversant with the recognised wiring systems and all relevant regulations governing this type of work. Must possess knowledge of building construction and be capable of reading architects' and engineers' drawings. Able to prepare complete electrical specifications and illumination schemes. 5-day week. Pension fund. Reply to Box 886, giving details of age, qualifications, experience and salary required. 886

ELECTRICAL engineer required for electrical department of works in the North-East. Should have a sound practical training, drawing office experience, a knowledge of motor control gear resistance calculations, and preferably some experience of electrical heating for industrial applications. Apply giving full details of experience, technical qualifications, age, whether married or single, and salary required, to—Box 845.

ESTIMATING and supervising engineer required immediately by small London contractors. Only applicants having held similar positions need apply. Full particulars and salary required, to—Box 790.

ESTIMATOR required experienced in all types of contracts by electrical contractors, London area. Apply in confidence stating age, details of experience and salary required to—Box 9641.

FERGUSON RADIO CORPORATION Ltd., offers exceptional opportunities to draughtsmen wishing to make their career in the world of electronics, television and radio. Candidates preferably experienced in the radio and television industries, must have knowledge of mass production methods and workshop practice. Familiarity with Ministry requirements an advantage. Good salaries, pension scheme. Well equipped drawing offices and good working conditions. Apply Employment Manager, Ferguson Radio Corporation Ltd., Great Cambridge Road, Enfield, Middx. 786

FIBREGLASS Limited, makers of a wide range of insulation products, require a technical sales officer for sales development work in the electrical insulation field. Candidates should preferably have a science degree and be Associate Members of the I.E.E. Age between 27 and 36. Applications, with full details of posts held, salary required, etc., to—General Sales Manager, Fibreglass Ltd., Ravenhead, St. Helens, Lancs. 844

FIRST-class cable jointers required by large Midland contractors. Permanent engagement. Must be capable of jointing all voltage cables up to 12 kV.—Lee, Beesley & Co. Ltd., 6, Warwick Row, Coventry. 791

HANDLEY PAGE (READING) Ltd., The Aerodrome, Woodley, Reading, have an immediate vacancy for a senior aircraft electrical draughtsman for work on an interesting new project. Only those who are fully experienced in all aspects of the work should apply, and for the successful applicant there will be suitable housing accommodation provided. Please send full particulars of experience, etc., to—The Personnel Officer. 76

JUNIOR design draughtsman required, familiar with small transformers and chokes up to 20 kVA. Salary £500 p.a. Applications, giving full details of age, training and experience, to—London Transformer Products Ltd., Cobbold Road, Willesden, London, N.W.10. 729

LARGE London electrical wholesalers require order clerk. Superannuation scheme. Write stating experience and salary required to—Box 888.

MECHANICAL and electrical engineer with university degree required by firm of electrical manufacturers in Waterford, for position as a works engineer. Applicants should be under 30 years of age and have five years' experience. Write giving details of education, qualifications, experience and salary expected.—Box 9632.

MECHANICAL-electrical engineer, age about 35, required by old-established company manufacturing mining machinery including electric winders. Candidate of ultimately taking high executive position. Must have good knowledge of efficient production with a flair for general administration. Write, giving fullest detail respecting education, experience, qualifications, age and salary required, to—Box 859.

PIRELLI-GENERAL CABLE WORKS Ltd. have sales department staff vacancies for general correspondence and preparation of mains cable tenders. Apply in writing to—Sales Manager, Eastleigh Works, Eastleigh, Hants. 769

PROGRESSIVE company of electrical engineers manufacturing rectifiers and power distribution transformers, desires to appoint selling agents in several counties. Existing business capable of expansion is available on appointment. Technical education is desirable up to Higher National Certificate standard. Write for information, to—Sales Manager, Partridge, Wilson & Company Limited, Davenset Electrical Works, Leicester. 792

REPRESENTATIVE required for N.W. and N.E. London area to take over existing 4-figure monthly turnover. First-class opp. for live wire with own connection. Please give full details of exp., age and proposals to—W.E.C. Ltd., 37, Vauxhall Bridge Road, London, S.W.1. 889

ROTATING machines sales engineers, with experience of industrial and special application, are required by the Brush Electrical Engineering Co. Ltd., for staff expansion in the Birmingham, Manchester and Leeds areas. Preferable age range 28 to 35 years. Good salaries offered commensurate with experience. Candidates must have technical training preferably to H.N.C. or degree standard and professional qualifications. Please apply with full details to—The Chief Personnel Officer, Brush Electrical Engineering Co. Ltd., Loughborough, Leics. 890

SALES engineers required by progressive firm of electrical manufacturers for instrument sales in London and Manchester areas. Applicants should have knowledge of wide variety of electrical instruments and of commercial practices. Outside sales experience desirable, but men otherwise qualified will be given training. General salary and full expenses paid. Pension scheme. Reply to—Box 891.

SALES representatives required for the following areas: Scotland, Newcastle, Manchester, Midlands, South and South-West England; to promote the sale of Prestcold domestic refrigerators through electricity boards and dealer organisation. Salary, commission and expenses. Pension scheme and other facilities available. Apply in writing to —The Domestic Sales Manager, Refrigeration Division, Pressed Steel Company Limited, Cowley, Oxford. 908

SAN SALVADOR (Central America). Assistant distribution engineer, age about 28, required by Canadian-owned public utility, 35,000 consumers. Permanent position with promotion dependent upon ability, opportunity and acquirement of Spanish. Salary U.S. $400 per month at exchange 2.5 to £1. Income tax 3%; no pension. Full particulars supplied to applicants giving concise details education and experience. Apply letter only (no telephone messages) to—Mackness & Shipley, Consulting Engineers, Parliament Mansions, Abbey Orchard Street, London, S.W.1. 892

SENIOR draughtsman required for medium-sized switchgear firm in Manchester area. Must have experience in all types of switchgear, both high and low tension; must be able to diagram and protective schemes. Apply by letter giving age, experience and salary required. Good salary for suitable draughtsman.—Box 847.

SENIOR draughtsmen required, with experience of power transformers. Experience on on-load voltage regulators an advantage. Good salary, contributory pension scheme. Apply stating age, experience and salary required to—Brentford Transformers Limited, Kidbrooke Park Rd., London, S.E.3. 830

SENIOR or junior draughtsman required for work on electrical power resistances and large electrical heaters for industrial applications. Previous experience on this class of work is desirable but not essential. Apply giving full details, including age, technical qualifications, whether married or single, and salary required, to—Box 846.

SENIOR transformer design engineer required to fill an important post becoming vacant in the immediate future. Sound basic education and training followed by wide experience in transformer engineering is essential. The salary and service conditions will be commensurate with the senior status and importance of the position. Applications giving full details of training, experience, age, salary, etc., should be addressed to — The Chief Personnel Officer, The Brush Electrical Engineering Co. Ltd., Loughborough, Leics. 823

SENIOR wiring diagram draughtsman required for preparation of diagrams of control equipment for all types of electric furnaces. Technical qualifications up to H.N.C. standard. 5-day week; canteen facilities. Write stating age, details of experience and salary required to—Electric Furnace Co. Ltd., 161 Queens Rd., Weybridge, Surrey. 172

THE DISTILLERS Company Limited require for their Engineering Division London Office two junior electrical draughtsmen for power and lighting layouts, with a knowledge of flameproof installation and equipment for industrial and chemical plants. O.N.C. technical qualification is required. Replies giving full details of experience, qualifications, age and salary should be addressed to—The Appointments Secretary, The Distillers Company Limited, Engineering Division Southern Office, 82, Piccadilly, London, W.1. 909

TRADE counter hand required. Apply giving details of experience, etc., to—Simplex Electric Company Ltd., 217-9, Tottenham Court Road, London, W.1 (Tel. Museum 1500). 931

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

BERMUDA Electric Light Company vacancy.—All applicants are thanked; those on short list have been informed. 893

SITUATIONS WANTED

TRANSFORMER executive seeks senior post. Extensive knowledge manufacture, production, testing and research work. All sizes power transformers.—Box 9630.

FOR SALE

STEAM-DRIVEN GENERATING SETS

625-kVA (500-kW) Steam Alternator Set by BROWETT LINDLEY/L.D.C., for 400/440/3/50, 4-wire, with 230/250 volts line to neutral. Speed 333 r.p.m. Steam pressure 165 lb. sq. in., against 15 lb. back pressure. Makers advise would operate with steam at 180 lb. sq. in., against 20 lb. back pressure.

665-kVA (500-kW) Steam-driven Alternator Set by BELLISS & MORCOM/SIEMENS, for 5,000/3/50, 77 amps. Steam pressure 150/155 lb. Speed 333 r.p.m.

250-kW Turbo-Generator Set by W. H. ALLEN/MATHER & PLATT, for 220/230 volts D.C. Steam pressure 150 lb., exhausting against 5 lb. back pressure. Speed 6,000/650 r.p.m. through reduction gear.

250-kW Geared Turbo Generator Set by BELLISS & MORCOM/CROMPTON PARKINSON, for 207/230 volts D.C. Speed 1,000 r.p.m. through reduction gear. Multi-stage turbine designed for steam at 290 lb., 550° F. superheat, plus 25% overload for two hours when running at 6,000 r.p.m.

250-kVA Steam-driven Alternator Set by BELLISS & MORCOM/HARLAND, for 400/3/50, 360 amps., 0.8 p.f. Steam pressure 140 lb., 12 lb. back pressure.

GEORGE COHEN, SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241). 922

ELECTRICAL EQUIPMENT FOR SALE

ENQUIRIES are solicited for:—

One 10-h.p. BROOK 3-phase, 400/440-volt S.C., 1,000-r.p.m. Motor, complete with IGRANIC push-button starter.

One CROMPTON PARKINSON 5-h.p. S.C., 3-phase, 400/440-volt, 940-r.p.m. Motor.

One CROMPTON PARKINSON 30-h.p. S.C. Motor, 3-phase, 400/440 r.p.m., complete with ALLEN WEST push-button auto starter.

Two HOWELL 5-h.p. Motors, 3-phase, 400/440 volts, 1,000 r.p.m.

Two STURTEVANT Extraction Fans driven by 13-h.p., 3-phase, 400/440-volt S.C. Motor, 34" blades, intake 21" diameter, exhaust 17".

One 25-h.p. ALLEN WEST push-button Slipring Auto Starter, 400/440 volts.

RIDING & ANDERTON
Seven Stars Sawmills, Wallgate, Wigan
929

NEWMAN

Special Offer

TWO 360-h.p., 735-r.p.m., 400-volt, 3-phase, 50-cycle, pipe-ventilated Slipring Motors by MATHER & PLATT having two endshield roller bearings, two pedestal roller bearings, fabricated baseplate and shaft extension. Each complete with automatic motor-operated liquid rotor starter. All new 1946.

NEWMAN INDUSTRIES LIMITED
Yate, Bristol
(Phone: Chipping Sodbury 3311). 894

Always SPECIFY and USE the
PORTAWAY EARTH-CONTINUITY SYSTEM
Efficient — ECONOMICAL — Enduring
PORTER ELECTRICAL PRODUCTS LTD.
Bramhope, Leeds, England (Phone 73428). 196

A BABCOCK & Wilcox water-tube boiler will cut down your fuel costs; we can supply from stock. Two 50,000 lb. evap., 310 lb. w.p.; two 40,000 lb. evap., 200 lb. w.p.; two 25,000 lb. evap., 250 lb. w.p.; two 16,000 lb. evap., 190 lb. w.p.; also marine, Cornish, vertical, etc. We install complete, including brickwork.—Burford, Taylor & Co. Ltd., Boiler Specialists, Commercial Street, Middlesbrough (Tel. Middlesbrough 2622). 36

A BARGAIN in electric motors can always be obtained from A. Cooksley & Co. Ltd., 21-35, Tabernacle St., London, E.C.2. Tel. Monarch 3357. Stocks at present comprise new squirrel cage motors, 1-25 h.p., also new and secondhand slipring motors, with starters, from 7½ b.h.p. to 30 b.h.p. 50

A HIGH-vacuum impregnation unit or single or batch coil impregnation service to B.I.C. specification 214 or individual requirements.—Blickvac, 505, Lordship Lane, London, S.E.22 (Tel. Forest Hill 7089). 44

A.C. and D.C. house service meters, all sizes, quarterly and prepayment, reconditioned, guaranteed one yr. Repairs and recalibrations. — The Virta Electrical Co., 47, Battersea High St., S.W.11 (Tel. Battersea 0780). 138

A.C. and D.C. motors, all sizes, large stocks, fully guaranteed. — Milo Engineering Works, Milo Road, East Dulwich, S.E.22 (Forest Hill 2278-9). 102

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9) 91

A.C./D.C. meters.—The Electric Meter Company, Castle Circus House, Torquay. 9634

ALTERNATOR control panel cubicles, 1,000 kW, 500 kW, 250 kW, 150 kW, 3-phase, 440 volts.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 31

ALTERNATORS for sale. Large stock from ½ kVA up to 250 kVA, all voltages, 50 or 60 cycles. Automatic regulators and switchboards also available.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 912

ALTERNATORS, 2 kW to 30 kW, single and 3-phase; also D.C. generators. Lists.—Powerco Ltd., Wandsworth Town Station, York Road, London, S.W.18 (Tel. Vandyke 5234). 151

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 33

AUTOMATIC hole cutter. Cuts holes without stops to regulate. Eliminates "digging in," broken cutter, etc. Electric or gas sets from 53/-.—Euco Tools Ltd., Dept. K.R., 44, London Road, Kingston-on-Thames (KIN. 9029). 226

BATTERY chargers, 6 v. and 12 v., 2 amp., with meter, complete with clips and mains lead ready to plug in, 200/250 v. A.C., £2 16s., post 2s. 1d. Unconditional guarantee.—Malden Transformer Supplies, Malden Rly. Station, New Malden, Surrey (Tel. MAL. 2655). 831

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 37

CIRCUIT breakers, 300 amps., 3-phase, 50 cycles, Crompton Parkinson clad type, floor mounting, 25 MVA rupturing capacity. Number available.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1. 21

CIRCUIT breakers, 400/3/50, cubicle type; 3 500 amp., 5 250 amp., each with busbars, isolators, volt and amp. meters. Made 1950 by New Switchgear Co. Ltd.—Airedale Factors Ltd., Mitchell St., Keighley 3418. 9626

CONVERTERS,, 110 v. and 220 v. D.C. to 230/1/50, 0.3 to 6 kVA, from £15 up.—Powerco Ltd., Wandsworth Town Station, York Road, London, S.W.18 (Tel. Vandyke 5234). 154

BUILDERS' pole ladders from well-grown Norwegian spars now in production. Also all sizes step trestles, telescopic trestles, push-up and rope-operated extension ladders. Write, phone or call—Shaftesbury Ladders Ltd., 453, Katherine Road, London, E.7 (Phone, Grangewood 3363/4). 23

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 24

CROMPTON PARKINSON draw-out truck type H.T. switch, voltage 6,600, switch capacity 600 ..., rupturing capacity 250 MV, T.P. spring-operated circuit breaker complete with instruments, earth leakage relay, three over-current relays, complete with one Bryce transformer, H.T. 6,600 volts, 3-phase, 50 cycles, 35.1 amps., L.T. 400 volts, 3-phase, 50 cycles, 578 amps.; will separate if required. Crompton Parkinson 80-h.p. S.R. motor, 400/440 volts, 3-phase, 50 cycles, 1,475 r.p.m., totally enclosed, fan cooled.—Shaw, Dale & Co. Ltd., South Parade, Leeds, 1 (Tel. 29141). 910

CURRENT transformers, ring type, 100/200 amps. Delivery ex stock.—Hurst Electrical Industries Ltd., 75a, Well St., London, E.9 (Phone, AMHerst 4166). 921

D.C. meters.—The Electric Meter Company, Castle Circus House, Torquay. 9635

DIESEL and petrol generating sets for sale. Large stocks up to 250 kVA. Also Lister diesel engines coupled to 9 and 10-kVA alternators.—Fyfe, Wilson & Co. Ltd., Bishop's Stortford. 913

DIESEL electric plants, new, 2 kVA, from £145, stationary or mobile.—Powerco Ltd., Wandsworth Town Station, York Road, London, S.W.18 (Vandyke 5234). 149

DIESEL generating sets, English manufacture, direct current, all voltages, all sizes to 500 kW.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 17

DIESEL generating sets, English manufacture, 3-phase, all sizes to 500 kW.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 16

DIESEL generating sets, various sizes for sale.—Alliance Electrical, 2, Henrietta Street, London, W.C.2. 47

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

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GENERATING sets, petrol engine-driven alternators, 220/240 volts, single-phase and 3-phase. — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 19

GENERATING sets, petrol engine-driven dynamos, 110 volts and 220-240 volts, direct current.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 18

GENERATING sets, 100's, ex M.O.S., at fraction of cost, 300 w. to 50 kVA. Lists free.—Powerco Ltd., Wandsworth Town Station, York Road, London, S.W.18 (Vandyke 5234). 153

HACKBRIDGE oil-immersed transformer, 11-kV/440 v., 3-phase, 50 cycles, delta-star, 750 kVA. Complete with Ferguson Paillin type BV.4 oil-immersed circuit breaker. For price and delivery apply—Whitefield Machinery & Plant Ltd., Cobden St., Salford, 6 (Tel. No. Pen. 1373/4). 923

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., s.-ph., 50 c., 2½ amps., 7s. 6d. each, 1s. 6d. postage; 5 amps., 17s. 6d.—Universal Electrical, 217-221, City Road, London, E.C.1. 28

HOUSE service meters.—The Electric Meter Company, Castle Circus House, Torquay. 9636

HUTS, Ladders, all types, from Podmore Works, Garratt Lane, London, S.W.17 (Wimbledon 7622). 210

IMMEDIATE delivery new 330-kVA. 400-volt, 3-phase, 50-cycle, 4-wire B.T.H. alternator direct coupled to 400-h.p. Paxman diesel engine, 1,000 r.p.m., complete with switchboard and A.V.R. control.—C. J. Ferguson & Sons Ltd., 33, Barbican, London, E.C.1 (Monarch 5474/5). 104

MERCURY switches are made by Hall, Drysdale & Co. Ltd., of 58, Commerce Road, Wood Green, London, N.22 (Tel. Bow 7221). 182

METERS, A.C./D.C., quarterly or slot.—Brent Electrical Co., 6, Holmdale Gardens, London, N.W.4 131

METERS reconditioned, all types, quarterly credit, single and three-phase, 3/4-wire, 2½/100 amps. Prepayment A.C./D.C., single, dual, triple coin, fixed or variable tariff, 2½/50 amps. Delivery ex stock, guaranteed, free catalogue lists 200 types.—The Electric Meter Company, Castle Circus House, Torquay. 9633

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POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Rd., London, E.C.1. 203

POLYPHASE 3/4-wire meters.—The Electric Meter Company, Castle Circus House, Torquay. 9637

PREPAYMENT meters.—The Electric Meter Company, Castle Circus House, Torquay. 9638

PREPAYMENT 1s. slot house service meters.—Universal Electrical, 217-221, City Rd., London, E.C.1. 27

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TWO 3-h.p. B.T.H. infinitely variable 400/3/50 motors, 3 h.p. at 2,500 r.p.m., 0.4 at 625 r.p.m.—Electro-Mechanical Supplies Ltd., 28/32 The Butts, Coventry. 796

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DIESEL engines or diesel-driven generator sets, 100 kW up to 400 kW, slow speed preferred. — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 14

MODERN electrical machinery and plant, i.e., mercury arc rectifiers, H.T. and L.T. switchgear, transformers, etc., etc. Must be good, such as you yourselves would buy.—Whitefield Machinery & Plant Limited, Cobden St., Salford, 6 (Tel. No. Pen 1373/4). 925

REDUNDANT diesel engines and gen. sets. — Harry Murfet, Daleside Road, Nottingham. 240

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WANTED. D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady Street, Bethnal Green, E.1. 32

WANTED, rotary converters, any sizes. — Universal, 221, City Road, London, E.C.1. 26

WANTED, three-phase induction regulator, alternatively Breco or Ferranti transformer type, rating 10 kVA or nearest.—Whitefield Machinery & Plant Ltd., Cobden Street, Salford, 6 (Tel. Pen. 1373/4). 798

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AERIALITE LIMITED

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Mr. L. S. Hargreaves on Demand for Products

THE Twenty-first Ordinary General Meeting of Aerialite Ltd. was held on 16th December at Stalybridge, Mr. L. S. Hargreaves (Chairman and Managing Director) presiding.

The following is an extract from the Chairman's statement circulated with the report and accounts:—

I have a very successful year to report, with an increased turnover from last year of 14%. This is not quite as quick progress as we have experienced in other years, but nevertheless, taking into account the very much lower prices at which it is now necessary to sell at to meet competition, I feel this is quite good progress under the conditions ruling.

The profit before taxation is up by 18%, and this has been achieved by the company's drive to reduce costs which are continuously before us.

Again our major problem is taxation. This still takes 59.6% or £92,238 of our profit, some of which, as you will see is in payment of excess profits levy. We are thankful that at least that imposition is now removed. Although taxation is slightly reduced on previous years, it still is a great burden to this company, and in fact on all industry in Britain. It makes it very difficult indeed to expand at the speed which I feel a well-run business could expand.

All-round Expansion of Business

Our business is exceedingly active, and some of the new products which I mentioned last year have now been put on the market with the result that all sections of the business have increased very considerably since these figures were obtained. We have just completed six months of our next year's period and we have achieved a very considerable increase in turnover on the present year, and also this is reflected in the profit figure. If the year continues on the same basis, as I have every hope it will, I should have a very satisfactory picture to put before you next year.

The cable industry is still in a state of flux due to the slowness of the Government and the Monopoly Commission whose report on the cable industry was issued so long ago. Unfortunately, the powers that be are still keeping their views a secret and the industry is, of course, very much the worse for that.

The extension of the factory which we have now completed is in operation and it has fully justified the expenditure of this undertaking. We are increasing our turnover and our profit rapidly due to this, and I feel that it will be a very successful arrangement. The extension of the factory has enabled us to expand our television aerial production and we have a number of models which are very much in demand. Our problem is not to sell them, but to produce sufficient, and I hope that gradually we shall be able to increase the output with a view to supplying an ever-widening market.

Progress of Subsidiary Companies

Our subsidiary company, Nettle Accessories Ltd., has had another good year and their profit has increased, as also has their turnover. They have maintained the dividend due to us of 250%.

At the time this report goes to press I am unable to say whether the African company will pay us a dividend this year or not. They are, of course, also expanding rapidly and require their earnings to be ploughed back for the time being in order that they can establish themselves, as I believe they certainly will. They are producing good trading results and I feel that our company will ultimately benefit considerably from the investment in that company. We have received a share bonus of 100% on the capital investment in this African company and during the year Aerialite Ltd. have increased their holding in the African company, which I feel will show us good results at a later date. The South African company, of course, is not a subsidiary of ours and is South African controlled, as I have previously pointed out.

Our order book generally is healthy; we have substantial orders from Government Departments, Electricity Boards, the building trade, radio and television manufacturers and the motor trade, and many more architects are specifying both our ASHTON Rubber Cables and ASHATHENE Polythene Cables and our NETTLE Electrical Accessories.

You will note that there is a profit before taxation of £154,671 for Aerialite Ltd., and a profit of £186,513 for the group excluding the African company as against £154,979 last year. The interim dividend has been declared and paid in April of 33⅓%, and your directors recommend a final dividend of 55%, which is the same as last year.

I feel now that we have established our shares on a good dividend basis and that we are giving our shareholders a fair return, that we can utilise increasing profits to build up more reserve, and I feel that this is the correct procedure, as I am anxious to strengthen the financial conditions of the company as we go along.

I think you will agree that we have produced a very satisfactory picture again this year and you will be pleased, I am sure, with the report of progress for next year.

As this year is our twenty-first birthday year, I feel we should make special provision for a staff bonus, and we have reserved for this purpose an amount which will enable us to give the employees in the business a special bonus this year.

The report was adopted. 903

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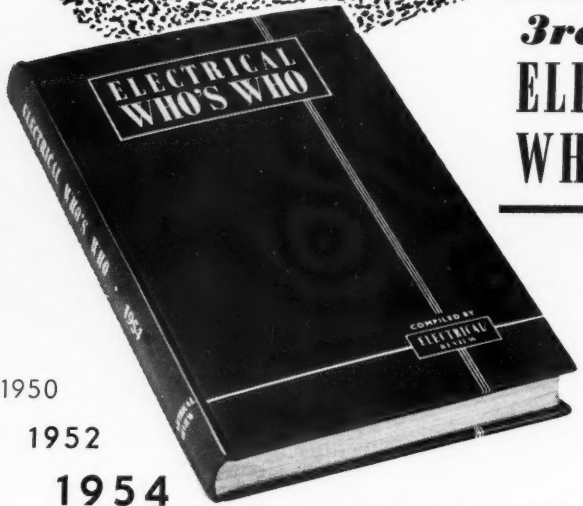

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The second edition appeared in 1952 and the new edition will be substantially enlarged; it will contain about 5,000 biographies of men and women in Government Departments, the electrical consulting, supply, manufacturing, trading and other branches of the profession and industry.

There will be an additional section devoted to firms and organizations in the industry giving the names of the principals.

The advertisement section on this occasion will be available for manufacturers to give the names of their various branches at home and overseas and a list of their products.

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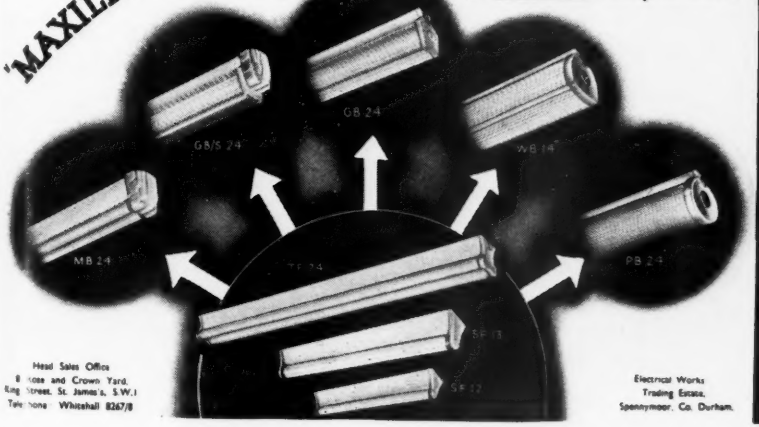

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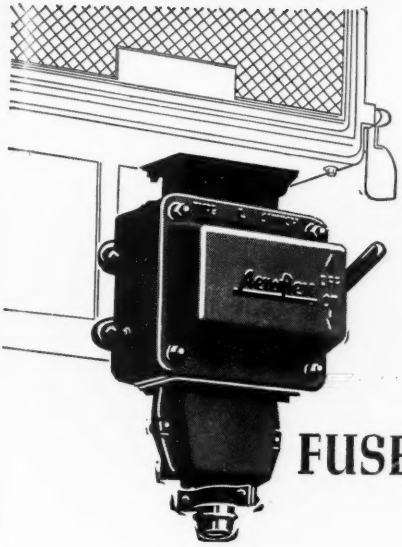

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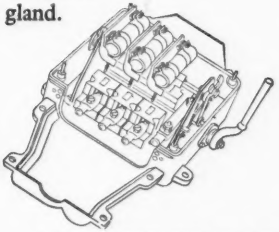

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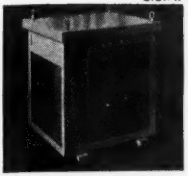

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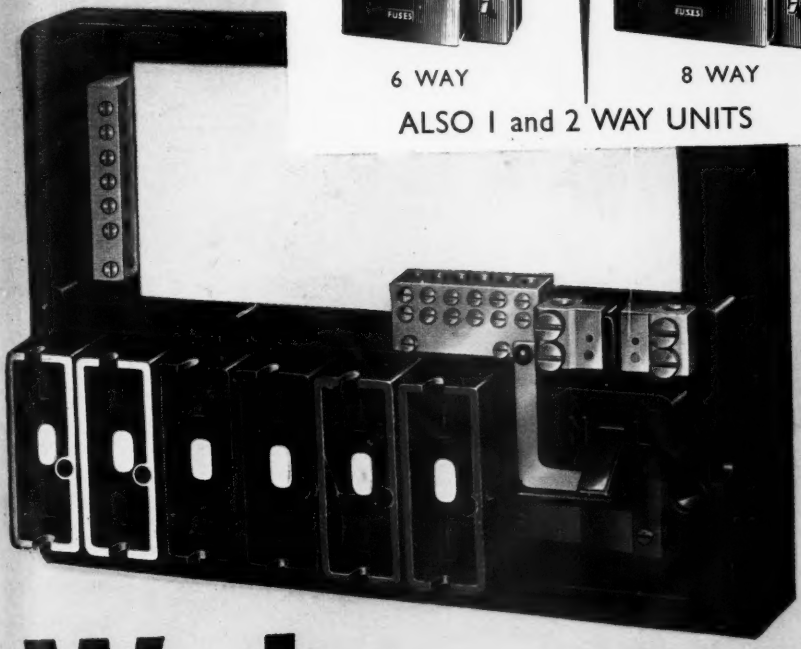

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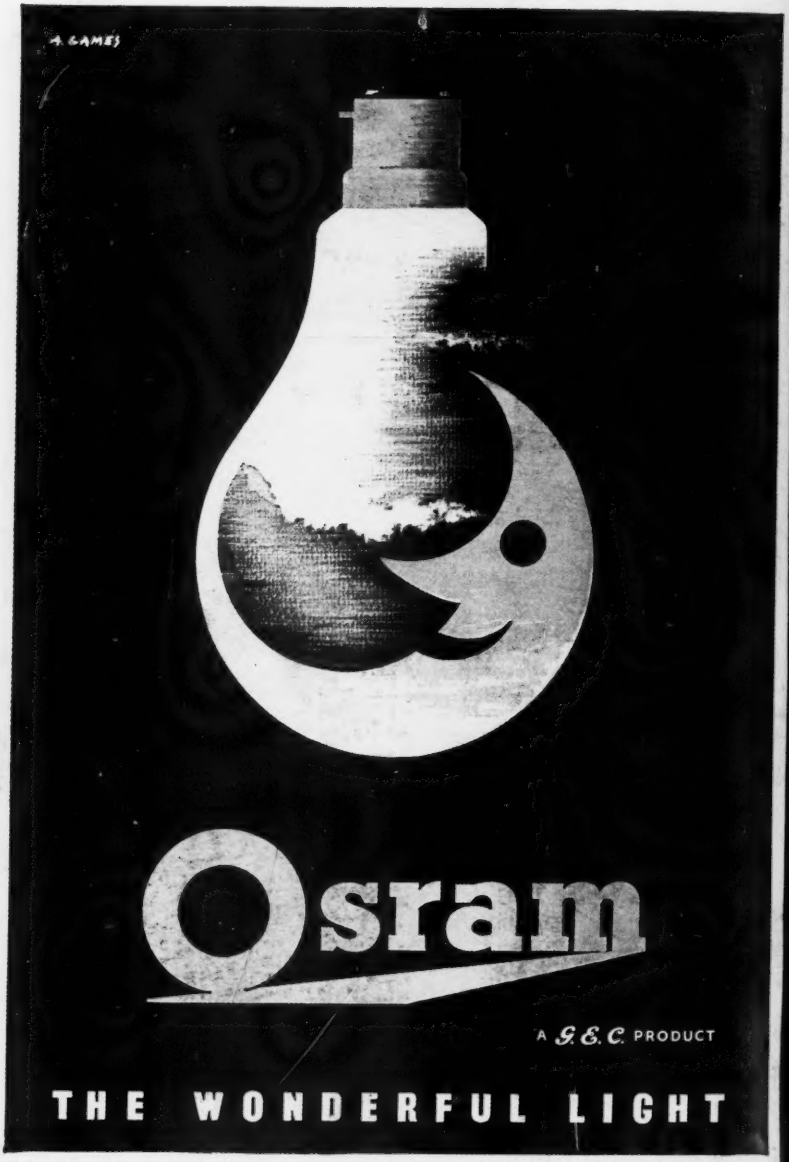

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